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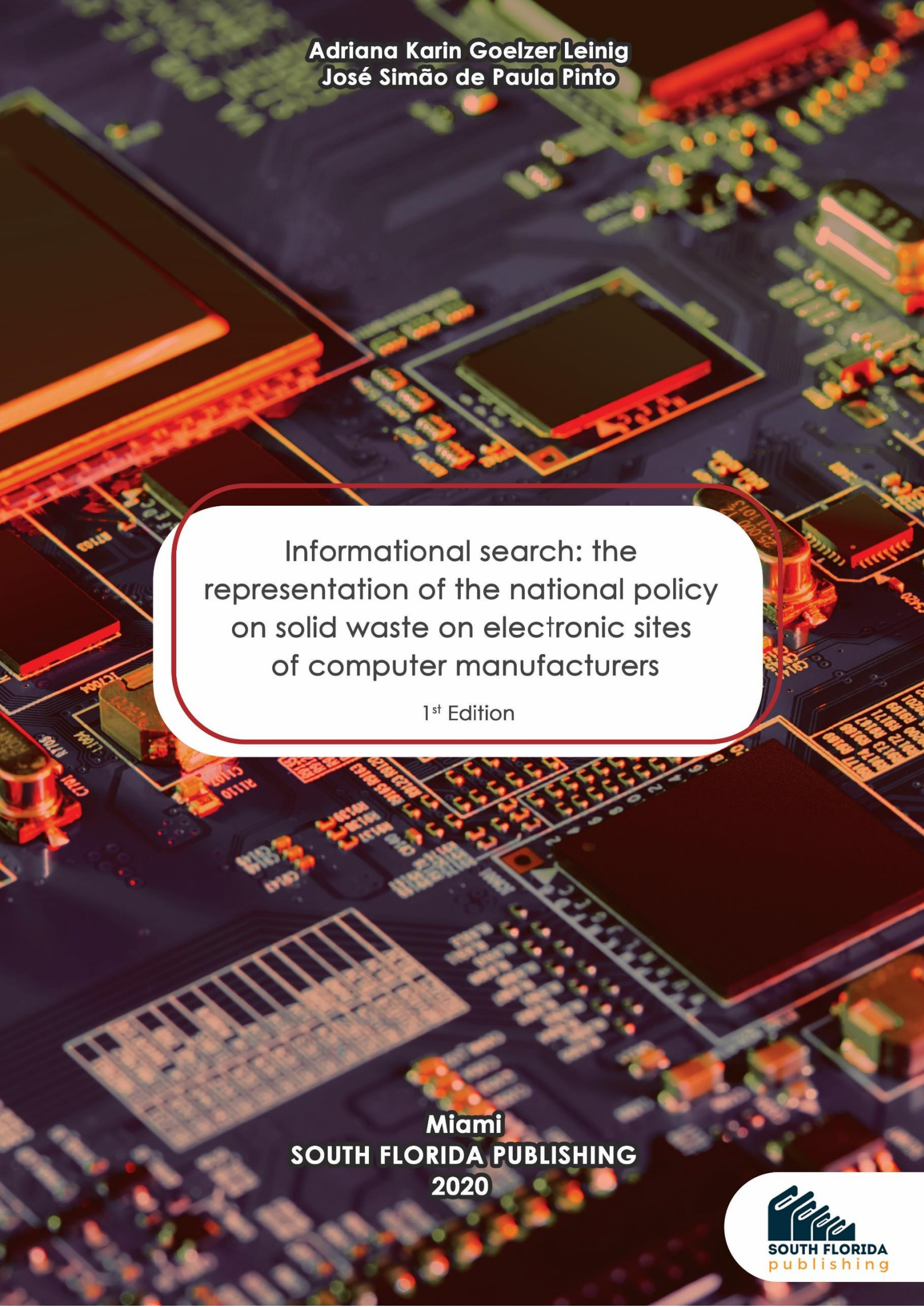

Informational search: the representation of the national policy on solid waste on electronic sites of computer manufacturers

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PRESENTATION

Imagine the following situation, an old television (tube) discarded in the stream of a river. It was exactly this scenario that was designed and gave rise to initial inquiries, mainly regarding the questioning of the disposal process. Basic questions like, action verification can be considered as correct, does this attitude cause any impactful relationship in the environment? If at least one of the questions is negative, we can still glimpse and see if there are possibilities and alternatives for effective action. Mainly checking and aiming, the harmonic result of the inevitable use of electronic devices and the environment.

The vast majority of readers will be able to identify the conduct in disposing of electronic devices incorrectly in the environment as erroneous. Therefore, we can advance a little more in our thoughts, when we list the object, the information. This objective proposition, the verification of the availability of information in a correct way, mainly when we deal with information to users of electronic devices.

The central issue regarding the availability of information effectively, in view of the disposal of electronic equipment, which are the responsibilities of the agents (government, manufacturer and users), the structure of this book has been outlined. Chapter 1 presents general notions of the research problem, placing the reader within the research scenario. Chapter 2 deals with information as an object and its management.

Chapter 3 covers the entire trajectory of electronics from its conception, life cycle and market aspects, accelerating the disposal process. Following in Chapter 4, we will trace the environmental impacts resulting from the incorrect disposal of electronic devices, actions such as the National Solid Waste Policy (PNRS) and minimizing environmental actions / laws. In Chapter 5 and 6, we will learn about business actions and strategies, mainly focusing on processes of Reverse Logistics, Green Product and Green Marketing.

In Chapter 7 we will present the research protocol to verify the availability of information, with the objective of the effective correct disposal of electronic devices, as well as the availability of information. And finally, in Chapter 8, presentation of the overview of practices effectively exercised by computer manufacturers. In Chapter 9, the presentation of debates perceived by the studies carried out.

We hope that, at the end of the book, the reader can perceive an inevitable reality, the use of technological resources. Therefore, one must think about how to manage its use and disposal, with the objective of welfare to the environment. Thoughts and responsibilities that must be extended to all government agents, manufacturers and consumers / users of electronic devices.

The authors

ACRONYMS

ABDI - Brazilian Industrial Development Agency
ABNT - Brazilian Association of Technical Standards
ABINEE - Brazilian Electronic Electrical Industry Association
BIM - Business Information Management
CETIC - Regional Center for Studies for the Development of the Information Society
CO_2 - Carbon dioxide
CP - Decisions of the Conference of the Parties
EEE - Electro-Electronic Equipment
EPA - Environmental Protection Agency
EPEAT - Electronic Product Environmental Assessment Tool
EPR - Extended Producer Responsibility
FEAM - State Environment Foundation
FGV - Getúlio Vargas Foundation
GI - Information management
GIE - Enterprise Information Management
GIRSU - State Plan for Integrated and Associated Management of Solid Urban Waste of Paraná
IBGE - Brazilian Institute of Geography and Statistics
IDC - International Data Corporation
ISO - International Organization for Standardization
LCD - Liquid Crystal Display
LR - Reverse Logistics
MMA - Ministry of the Environment
NI-IAS - United Nations University – Institute for the Advanced Study of Sustainability
ONU - United Nations Organization
PMC - Curitiba City Hall
PNEf - National Energy Efficiency Plan
PNRS - National Solid Waste Policy
R - Reconfigure
RE - Electronic Waste
REEE - Electro-Electronic Equipment Waste
RoHS - Restriction of Certain Hazardous Substances
TI - Information Technology
TIV - Green Information Technology
3R - To reduce, to reuse and to recycle
WEEE - Waste of Electrical and Electronic Equipment

SUMMARY

CHAPTER 01
INITIAL NOTIONS

Man is able to transform data into information and generate a certain level of knowledge. This relationship contributes to a dependence and strong link between information and technology. Its users, increasingly have needs to search for information and for this purpose, use several technological tools. With that, nowadays, the use of electronic equipment, specifically computers is essential, both in the corporate environment and in the domestic environment.

The world is undergoing rapid and constant changes, where the interaction and relationship between human beings, society, organizations and the environment are marked by paradoxes, contradictions, challenges, threats and opportunities. Transformations in society are changing the behavior of organizations, society's values, the world view and the way of life of individuals (Felix, 2003).

These changes in the universe of information and technology contribute to changes in the modes of production, to satisfy the needs of the market; as well as changes in the mode of consumption of technological products[1], aiming at the ease of obtaining information. Such factors lead to perceptions and questions that were not previously perceived and pointed out. The concern with the use of natural resources, the understanding of their limits and the guarantee of their adequate disposition, for future generations, are factors that are now widespread and applied.

The claim for technology can mask the central purpose of information, which is to inform. All computers will be of no use to their users if they are not interested in the information that these computers can produce (DAVENPORT, 1998).

Considering the spheres of sustainable development: society, economy and environment, in addition to the growth in consumption of technological products, which satisfy the individual's need in the search for information, certain questions are necessary. Concerns when purchasing technological equipment, how to use it during its useful life and how to properly dispose of it, represent important points that must be evaluated and addressed. However, the entire construction of this framework inevitably triggers a great involvement of the spheres of society, economy, environment, as well

[1] For this research, the terms: technological equipment, electronic devices, technological tools, refer specifically to computers, the focus of the present study.

as pointing out challenges / threats and opportunities.

Aiming at these perspectives and considering that the search for information is essentially supported with the use of technological tools, the description of this scenario is represented as an irreversible process. With the pointing out of this set of problems, the survey of minimizing alternatives, can contribute favorably ahead of solutions.

To support all these changes, require changes in the positioning of companies, where more rigid, controlled and equated management, are essential to the current reality of organizations. All these adjustments and modifications must accompany the speed of changes in consumer behavior, new market needs and the constant dispute over corporate positioning.

According to the data presented by IDC - International Data Corporation, (IDC, 2017) the Brazilian computer market had a sales growth of 5 %, in the second quarter of 2017. 1.243 million equipment were sold between April-June 2017, compared to 1.182 million in the same period in 2016. The first quarter of 2017, showed a growth of over 12 %. Data also pointed by ABINEE (Brazilian Association of the Electronic Electrical Industry) which highlights Brazil's 10th position in the world computer market.

Within these aspects, the information provided in an effective and assertive way to users, are essential factors to contribute and cooperate for successes and in complying with the practices of the National Solid Waste Policy (PNRS) Green Information Technology (TIV).

The availability of information is a reality, knowing how to use it can contribute considerably to the adoption of PNRS and TIV, from aspects of acquisition to the disposal of equipment, on websites of computer manufacturers. Thus, assisting in environmental issues and compliance with regulations and legislation, with this approach we started our debate by explaining process conceptions and Information Management.

CHAPTER 02
PROCESSES AND INFORMATION MANAGEMENT (IM)

We started our studies by outlining and discussing the concepts of processes, emphasizing their applicability within organizational scenarios. We will also address the steps that encompass Information Management, starting from the point that information plays a fundamental and primordial role in business management. We will understand in this way, how the flow of information works, the importance and connection of each stage.

There are several ways of conceptualizing processes, one of which refers to the set of activities, which are interdependent with each other, and which are carried out, focusing on a common objective. When the processes are inserted within a business context, they represent an intraorganizational activity, where the set of actions are developed internally within the organization, with the aim of transforming inputs into products, which customers can value (PERRONE, 2006).

2.1 CONCEPTUALIZATION AND CHARACTERIZATION OF PROCESSES

We usually listen to the word processes many times, most of the time inserted into the business routine. But what is the real concept of process, what are its steps, what are the criteria that characterize the construction and establishment of processes? These types of questions are essential for understanding and understanding the mechanisms adopted for establishing processes.

According to Alvarães (2012), a business process represents a succession of activities determined through the application of a method, with the objective of reaching certain established goals. By determining a process flowing, it is possible to increase the efficiency and effectiveness of business productivity.

Still according to the author's considerations, there are some processes that are already established, but that for some reason have not yet been formalized, or that still do not work properly, efficiently. In this ambient, there may be a need for notes, analysis and optimization of processes, such as:

Survey of processes: action performed through tools, using questionnaires, interviews, or even by observations. For that, it is essential to understand the process and turn it into a flow; Process analysis: carrying out a critical examination, in order to identify points for improvement. Questions pertinent to this stage represent: what is

desired with this stage? What are the overall results produced? Who are responsible (step)? Do the results achieved justify the investment of the resources used? Is this the best way to perform the step? Is the knowledge of people related to the given stage really enough? In other words, to evaluate, identify and discover points of improvement in the processes; Process optimization: actions to minimize / eliminate failures, progression of quality, reduction of time and costs. This stage deals with the establishment of decisions: what to change or the creation of new processes. For this, some factors are essential, such as the need to eliminate some steps (avoid repetitive, unnecessary tasks), the combination (joining two different activities, with the purpose of the same result), simplification (making the process more simplified)) and finally the implementation (inserting new steps, in order to make the process more efficient or effective). Having understood the establishment of processes, we can enter the debate on Information Management, its stages, processes and its importance in incorporating into the daily business.

2.2 INFORMATION MANAGEMENT

Before addressing topics on the characterization of Information Management, we must understand the role and importance of information for business management. The description of this topic aims to understand the characterization and functioning of the information flow within companies and to place Information Management as a tool for articulating business processes.

In this way, Chaff and Wood (2005), identify information and technology, as essential resources for an organization, especially those that seek to highlight and improve their performance. The use of information and technology can bring new business perspectives, adding efficiency in business processes, reducing costs and providing performance measurement mechanisms, used to control improvements.

The use of information in an organization is vital, since it is considered and is inherent to each business process. Operations actions up to management use information extensively, and in order for it to be evidenced within an organization, they must allow: a) the perception of events in the external environment, offering responses according to the strategies and tactics adopted; b) research on demand for new products, according to different customers, different markets; c) monitoring and control operation processes, d) exchange of information between partners; d) internal and external message exchange to the organization (CHAFF; WOOD, 2005).

The researchers also approach information within the company's business processes, from three perspectives: 1) Business Intelligence: the use of information within the company, enabling the verification of its performance; 2) Business Performance Management: performance monitoring processes in comparison with established performance metrics; 3) Market Intelligence: the use of information external to the company, specifications of the market to which the company is inserted and competitive positioning of the corporation.

In parallel with the above considerations, another relevant factor confers on the transformations that the world has been going through, of which they are based on three trends, which collaborate with the high speed and constant changes: increasing globalization of the economy, explosion of communication and technological matrix. As a result, organizations are under various pressures and are constantly challenged to adapt to changes, studying customer expectations, competitive strategies, technological development, government policies and economic and society aspects more deeply. In this way, organizations are no longer solely interested in producing outstanding products in the market, but are seeking greater competitiveness, agility, winning over customers, punctuating their competitors' weak points and targeting business opportunities (Felix, 2003).

However, information management, according to Chaff and Wood (2005), is vital for supporting the operations of organizational processes and improving organizational performance. Information management makes it possible for companies to conquer their position in the market according to their operations.

Thus, the important strategies within Information Management, can be described among the following approaches: Add value: promoting better quality of products and services for customers. In this case, the information must be used to understand the client's characteristics (needs and satisfactions), market, trends; Cost reduction: the use of information in the business process more efficiently, that is, the use of information to create, make and deliver services; Risk management: strongly established with the use of information; Create a new reality: the use of information and technology for innovation, create new paths and the development of services and products.

Information Management (GI) in its fundamentals, according to Chaff and Wood (2005), revolves around three aspects: information (data, information and knowledge), people (employees, customers, collaborators, suppliers, government) and technology

(software, infrastructure, hardware and telecommunications), if one of these resources is not well managed, the establishment of the organization's GI will be inefficient.

For this, a management of management processes, there is a need for technological investments, in addition to basing a strategic vision in accordance with the established business objectives and goals, in addition to the strategic value of information. These relationships provide answers to essential questions, for the administrator, regarding the resulting impacts on the company, regarding the external scenario, customers and market. In addition to these perceptions, the use of information (its analysis) and the scoring of expected benefits, with the help of the use of information systems, allow the identification of the potentials generated with the adoption of each solution and the weighting of business priorities. (Felix, 2003).

Strengthening these considerations, an Enterprise Information Management (GIE) - Business Information Management (BIM) represents the information management processes, using strategy as a resource, to improve organizational performance. This set of actions requires the development of strategies and the implementation of systems and controls, for the delivery of quality information (value of information) (CHAFF; WOOD, 2005).

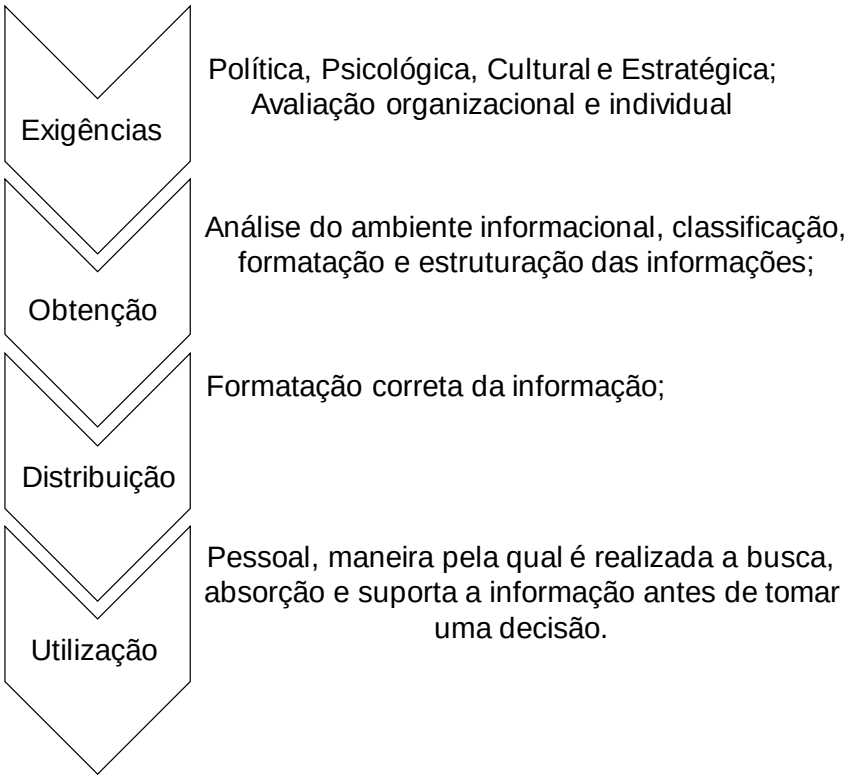
For a favorable GIE it is necessary to determine the quality of the information. The information will only support the organizational processes, when it presents a certain quality, in this way, it can assist the development of tasks and decision making. Poor information quality can result in inefficient performance processes and non-assertive decisions (CHAFF; WOOD, 2005).

Still considering the quality of the information, it is necessary to understand some important attributes for information management. Within these, the relevance of information - ability to support decision making; and its precision - which should be sufficient for the establishment of resolutions (CHAFF; WOOD, 2005).

Society is in a competitive boil, causing changes in concepts and attitudes, where globalization and its speed, correspond to the speed with which information is processed. Companies that disregard their consumers, their suppliers, the study of the organization's external and internal environment in their analysis, will have a limitation of their participation in a globalized market. In this scenario, the use of information plays a fundamental role, to the point that, organizations that obtain certain information in a more convenient way, can more easily obtain a competitive advantage in relation to their market (Felix, 2003).

The MI represents process is composed, basically, of four steps, represented through the Figure 01.

Figure 01 - Steps for the composition of information management.



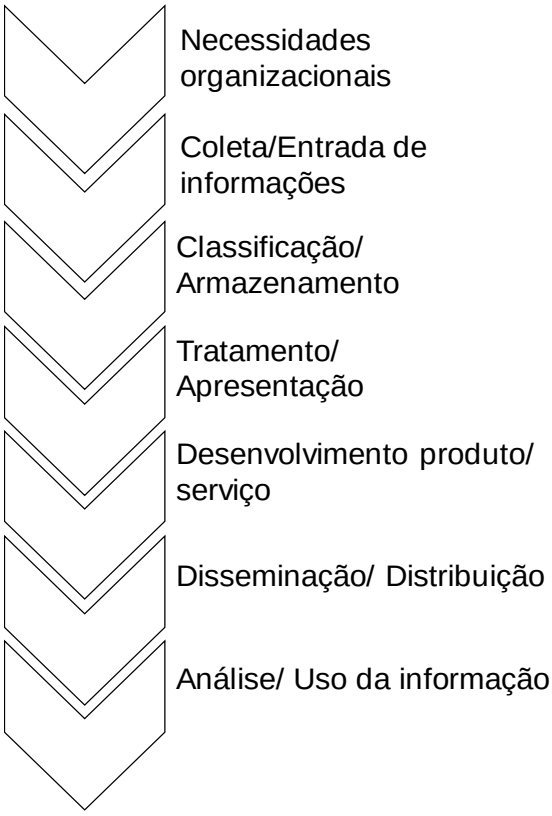
Source: Davenport (1998).

Subtitle: Requirements - Political, Psychological, Cultural and Strategic: Organizational and individual assessment; Obtaining - Analysis of the informational environment, classification, formatting and structuring of information; Distribution - Correct information formatting; Use - Personnel, the way in which search, absorption and information are carried out before making a decision.

Much has been done in the direction of improvement processes in business environments; information processes specifically, little is perceived in relation to the establishment of more rigid programs. This change is basically related to two aspects: little knowledge of the importance of these activities and also the difficulty of applying methodologies in the improvement processes (DAVENPORT, 1998).

Another approach to MI given by McGee and Prusak (2003), reflects the construction of seven stages: identification of the needs of companies, collection / entry of information, classification of storage, treatment / presentation, development of information products / services, distribution / dissemination, analysis / use of information. This new concept of GI is represented through Figure 02.

Figure 02 - Steps related to IM.



Source: Adapted from McGee and Prusak (2003).

Subtitle: Organizational needs | Information Collection / Entry | Classification / Storage | Treatment / Presentation | Development Product / Service | Dissemination / Distribution | Analysis / use of information.

There are several approaches to the constitution of the IG, with the aim of understanding and perceiving, on these diverse perspectives, Chart 01 represents some studies in a systematic way.

Chart 01 - Steps of the IG models.

IM steps	**Orna (1990)**	**Davenport (2002)**	**McGee/Prusak (2003)**	**Ponjuán (2008)**	**Beal (2008)**
Needs identification					
Determining requirements					
Acquisition (procurement) and collection					
Information classification					
Information Analysis					
Dissemination and distribution					
Use of Information					
Products and services					
Storage					

Source: Adapted from Santos (2017).

One can see a convergence in the stages of dissemination / distribution and use of information, regardless of the representation system of the construction of the IM, therefore, we will specifically explore the availability of information on the websites of computer manufacturers.

As seen so far, information and technology are strongly related. In the contemporary world, the ease of access to information is strongly provided through the use of computers. This scenario points to another bias, the consumption of technological equipment and its consequences, especially in terms of its impacts on the environment. In the next chapter, the entire design that sets up the situation of electronic devices since their generation, life cycle and marketing actions that emphasize their consumption will be presented.

CHAPTER 03
ELECTRONIC WASTE MAPPING: GENERATION AND TREATMENT

When we start studies on electrical and electronic waste, it is necessary to carry out a survey from its conception, that is, the factors that lead and contribute to the generation of this type of waste. For this purpose, we will also discuss issues of generation, the functioning of the life cycle, market factors that contribute to this scenario, with a focus on electronic equipment, these points are extremely important for this study.

3.1 GENERATION OF ELECTRONIC WASTE (REEE)

The computer science area was considered a polluting industry. With accelerated technological advancement, the life cycle of this equipment was shortened, consequently resulting in the generation of electronic waste (MATTOS *et al.,* 2008).

Emphasizing the relevance of the computer sector, Pires (2004) indicates that this type of industry is characterized by great global competitiveness, high replacement speed, new technologies and shorter product and model life cycles.

These factors contribute to the generation of electronic waste, of which, according to Ciocoiu *et al.,* (2010), are characterized by the following factors: accelerated pace of the generation of the quantity of its residues; diversification of equipment supplied for sale; technological progress; quality of life and population growth.

As a result, the increase in REEEs can be represented as a result of the high levels of consumption of these products and the still “immature” management of REEEs. Another important factor, which must also be considered, represents the accelerated rate of electronic innovation, which attracts people to buy more efficient products, replacing old devices with more efficient ones (COLESCA *et al.,* 2014).

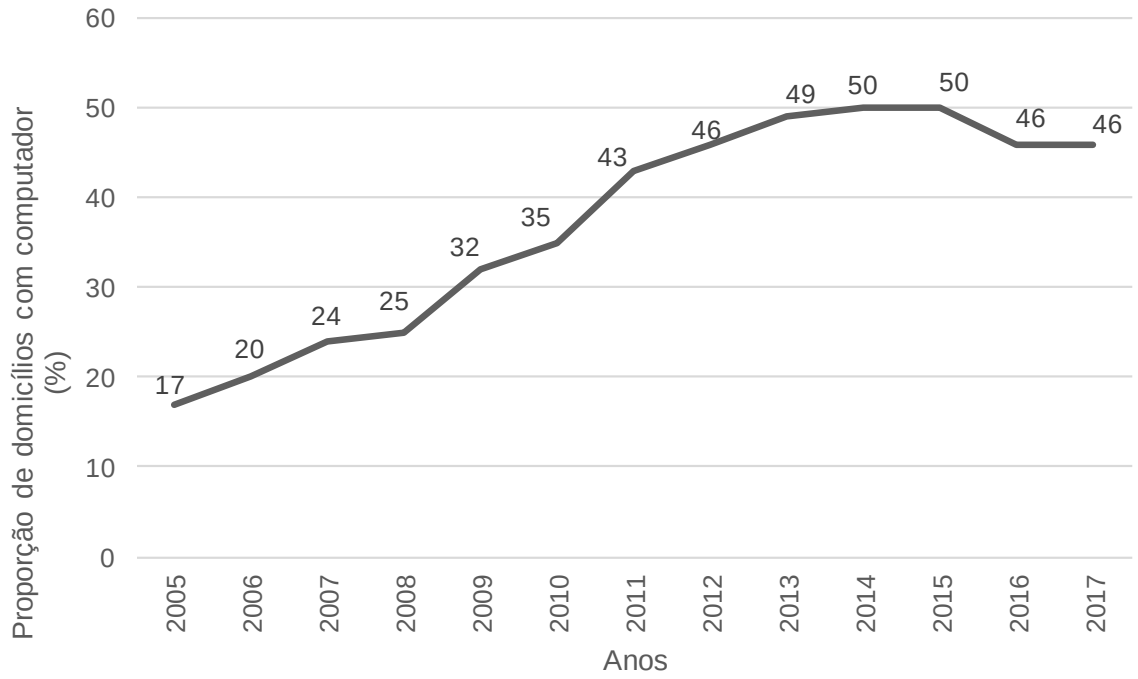
The amount of REEEs generated in the European Union is growing rapidly and its composition there are certain levels of hazardous components, causing great concerns, from the management of this waste to its recycling (WEEE, 2016).

Explaining the scenario of computers in Brazil, studies by FGV (2014) point to the number of 136 million computers in use in 2014, and this number increases to 200

million in 2017. It is also worth mentioning the estimate IBGE (2018), which indicates that the population of Brazil and Federation Units, representing approximately 208.9 million people

Bringing this reality to the proportion of households with computers in Brazil, according to the latest report by the Regional Center for Studies for the Development of the Information Society (CETIC, 2018), the percentage of total households is represented in Graph 01.

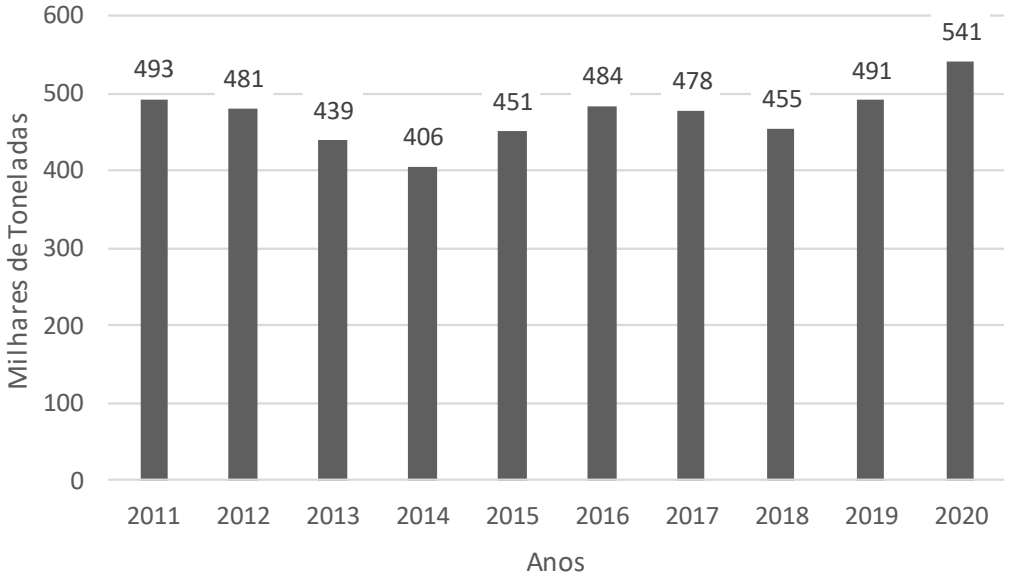
Graph 01 - Proportion of households with computers in Brazil -% of total households



Source: CETIC (2018).

Data pointed out by ABDI (2012) brings the potential volume of generation of REEEs in Brazil, such as: television, monitor, laptop, desktop, printer, battery, drill, mixer, blender from 2011 with projection until 2020. These data can be perceived in Graph 02. These data deal with the total volume of generation of REEEs considered small, the data does not bring quantification only for computers.

Graph 02 - Potential volume of generation of small REEEs from 2011 with projection until 2020, in Brazil.



Source: Adapted from ABDI (2012).

Studies carried out by Rocha and Gomes (2009) for the State Environment Foundation (FEAM) estimated the generation of 380 thousand / tons resulting from REEEs. With the projection of this scenario until 2030, each Brazilian inhabitant will produce around 3.4 kg of electronic waste, totaling 22.4 million tons of REEEs.

Data published by NI-IAS (2015), United Nations University - Institute for the Advanced Study of Sustainability, with the title “eWaste in Latin America”, Brazil represents the first place in the generation of WEEE, among the countries of Latin America, for 2018 it is expected to generate about 4800 k / ton of electronic waste, of which Brazilians are individually responsible for 8.3 kg of WEEE generation in 2018.

Presented the mapping of electronic waste, another subject that will help understanding between environmental issues and the treatment of electronic waste, represents the understanding and analysis of the life cycle of these products. The understanding of all topics, which encompass your process, are topics presented in the next topic.

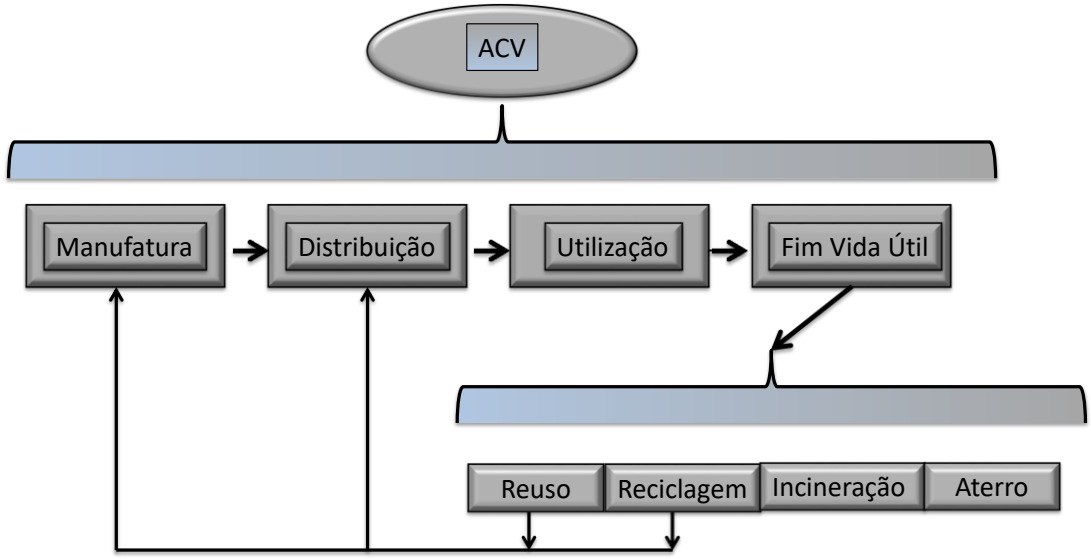
3.2 LIFE CYCLE – ELECTRONIC EQUIPMENT

The study on the life cycle has as main objective the analysis of the generation of a product, considering its several stages, in relation to its generated environmental impact. Here we can consider aspects from the extraction of raw material, all stages of its production process to finally its use, consumption and disposal.

The term life cycle is used in the sense of considering all stages, starting with the removal of raw material, production, manufacture, use, reuse, recycling and final destination. Factors such as the growing technology, the increase in the speed of obsolescence of products and finally the increase in consumption, lead to a considerable reduction in the useful life of some products, as well as their early disposal (REBITZER et al., 2004).

The life cycle for electronic waste can be seen through Figure 03:

Figure 03: The life cycle of electronic waste.



Source: Adapted from Zanetti (2010).

Bossuet (2014) indicates that the electronics industry cannot yet be seen as green or sustainable, as they are large consumers of raw materials, such as: water, electricity and chemicals. During the manufacturing process of electronic products until disposal at the end of their useful life, the result is large amounts of waste from products.

Teehan and Kandlikar (2012) consider that the Life Cycle Assessment (LCA) on computers, are analyzed to verify the environmental impacts of these products on the environment. In their studies, they conclude that the environmental impacts resulting from the consumption of electrical energy, during the process of manufacturing a computer is lower than the energy consumption, during the process of using computers. According to studies by Hopkinson and James (2011) in UK institutions indicate that environmental impacts and energy consumption, resulting from the

computer production process, are determining factors for institutions to also focus on minimizing energy consumption and costs. throughout the usage process. In this way, they ensure the acquisition of equipment that has the most efficient energy consumption during the manufacturing and use process.

The final disposal in an environmentally correct manner according to BRASIL (2010), includes processes of reuse, recycling, composting, recovery and use of energy. Destinations permitted by Organs competent bodies of Sisnama (National Environmental System), SNVS (National Health Surveillance System) and SUASA (Unified Agricultural Health Care System) are also authorized; in order to respect specific norms and mitigate damages to collective health, preserving safety and reducing environmental impacts. The environmentally appropriate final destination also comprises the distribution of waste in landfills in an orderly manner (NOEL, 2014).

There are many factors that must be considered when mapping the situation of electronic waste. In addition to the perceived changes in the consumption of technological equipment, there are other actions that contribute to the replacement and the search for new electronic devices, such as programmed obsolescence.

3.3 SCHEDULED OBSOLESCENCE

There are several marketing strategies that guide, its incentive to its periodic replacement. Here several aspects can be considered, from its design, the mass provision of new devices, offering new facilities, design, versions, duration and “evolutions”. This set of "strategies" can be represented as programmed obsolescence.

Programmed obsolescence is conceptualized by Giaretta *et al.,* (2010), as an industrial and marketing manifestation, aligned with the production and marketing process. The expectation of the duration of a good or product is reduced, planned in such a way that its function and durability extend, for only a limited period of time.

According to Andrade (2007), companies work with the movement of their goods according to the three obsolescence approaches: a) function - the product becomes obsolete when another product with a better function appears; b) quality - the product is designed to last certain moments (usually small); c) convenience - when the consumer's perception is lower in relation to the performance and quality aspects of a given product - changes in styles and improvements.

According to Tan *et al.,* (2003), technological evolution in an exponential way, with constant innovations, the emergence of new versions, improved performance, are

decisive for computer products (computers, printers, software and peripherals) to have their life cycle each shorter, and with that, generating the incentive and ease of its acquisition.

The search for constant consumption corresponds to a strategy, based on consumer discontent, who own goods or products with low durability or that in a way, no longer meet their expectations. These factors result in a periodic replacement of products and consequently their disposal (GIARETTA *et al.,* 2010). Completing these thoughts, Vega (2012) uses the programmed obsolescence approach, as a corporate strategy that aims at constant consumption and its periodic replacement, generating constant discards and a consequent increase in REEEs.

Studies by Yang and Willians (2009) indicate that in 2020 each person in the United States of America will use between 1 and 1.3 computers. They also reported data on the obsolescence of computers, verifying the sales potential regarding the useful life of this equipment, concluding that approximately in 2010 the number of computers sold was very close to the number of computers at the end of their useful life. In 2020, about 90 - 105 million computer units will be obsolete, and in 2050 these numbers will rise to 144 million.

Bossuet (2014) complements the studies in the area, indicating that factors such as the high rate of substitution and the short useful life of electronic products, result in large quantities of REEEs. In reducing the environmental impacts of electronic products, the 3R (Reduce, Reuse and Recycle) trilogy does not seem to be enough. Therefore, the suggestion presented with the objective of a sustainable industry, corresponds to the inclusion of a fourth R - Reconfigure, which is equivalent to the capacity of reconfiguration in circuits (rewritten), this proposal tends to reduce the functional obsolescence of certain electronic equipment. Several computer manufacturers use programmed obsolescence as a commercial strategy, with the release of new versions of products each year.

Several factors contribute to the generation of waste from electronic equipment. Considering this reality, a factor becomes essential within these considerations, it points to the chemical composition of these devices, and consequently how the disposal performed incorrectly, can directly and negatively impact the environment. Questions about this topic also lead us to considerations, mainly dealing with actions aimed at minimizing environmental impacts, these considerations are exposed below.

CHAPTER 4
ENVIRONMENTAL IMPACTS AND MINIMIZING ENVIRONMENTAL TREATMENTS

Given the panorama of the generation of waste from electronic and electronic equipment, we can now advance in our studies, debating on the composition of these devices, environmental actions that aim to deal with the problem, as well as presenting the concepts of LR and the legal framework on solid waste in Brazil.

4.1 REEE SUBSTANCES AND THEIR IMPACTS

The study and understanding of the composition of electronic waste also has its importance, since they are the ones that directly negatively impact the environment. The contamination of these substances can affect the pollution of soil, water and air, seriously contaminating various systems and their surroundings, and can bring various diseases to humans.

According to ABDI (2012) REEEs have several materials in their composition: glasses, plastics, electronic components and more than twenty heavy metals. Usually these materials are arranged in layers and fixed with solder or glue, some of them even receive a specific jet of chemical compounds, for the purpose of protection and flame retardants.

According to e-Waste Guide (2015) some materials from REEEs are harmful to human health and the environment, these can be better observed through ANNEX B.

Still considering the composition of the REEEs, ABDI (2012) points out that these residues have certain potentially toxic elements, which can cause two types of risks. The first relates to the contamination of people who are in contact with REEEs, and it may be the consumer who keeps old equipment and / or people who collect, sort, de-characterize and recycle this waste. The other type of risk establishes the contamination of the environment, that is, REEEs should not be discarded in nature under any circumstances.

Even if the destination of REEEs occurs in landfills, the contact of heavy metals with water, already results in the immediate contamination of leachate. When this contact occurs with the soil, contamination of underground sheets or accumulation in living beings can occur, bringing negative results to the environment (ABDI, 2012).

Specifically, the composition of metals in a printed circuit board of a computer according to Gerbase and Oliveira (2012), can be verified Table 01.

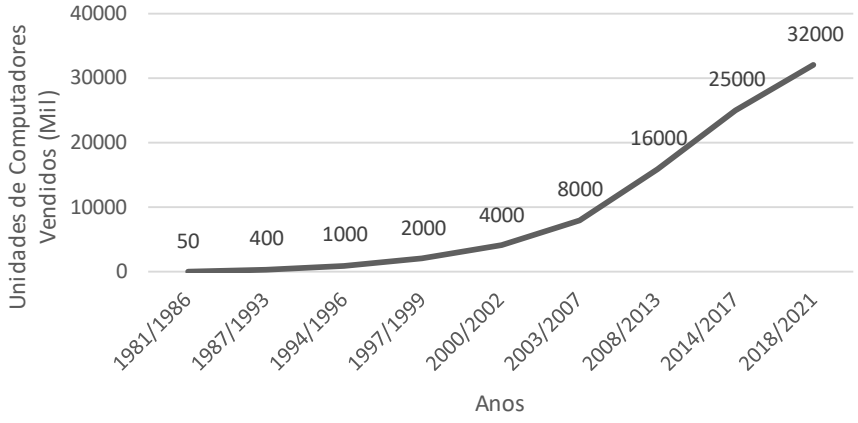
Table 01 - Composition of metals on a printed circuit board of a computer.

Metals	Percentage
Copper (Cu)	14
Iron (Fe)	6
Nickel (Ni)	2
Zinc (Zn)	2
Tin (Sn)	2
Silver (Pb)	0,3
Gold (Au)	0,04
Palladium (Pb)	0,02

Source: Adapted from Gerbase and Oliveira (2012).

In the case of inadequate disposal of REEEs, this causes great environmental concerns, due to the release of certain toxic substances (mercury, cadmium, arsenic, copper, lead and aluminum), which can negatively impact the environment. The incorrect destination of REEEs, can result in the contamination of plants and animals, through the contamination of the soil and groundwater. The sum of these factors, can cause problems in the population, through the consumption of contaminated products (ROBINSON, 2009). In addition to the concerns with the exposure of these factors, another essential point represents in the design of the scenario of the evolution curve and behavioral trend of the Brazilian computer market, which can be assessed through Graph 03 (SMF, 2014).

Graph 03 - Evolution and trends of the Brazilian computer market.



Source: Municipal Finance Secretariat (SMF) (2014).

As a result, the volume of electronic waste (RE) is increasing worldwide and there are indications that this scenario will remain this way for many years. The reasons range from the emergence of new technologies, to the more affordable prices of electronic products (ONGONDO *et al.,* 2011). With all these explanations about the environmental concerns perceived as consumer changes, still about 7 % of them, still carry out the disposal of their electronic waste in common waste (ABINEE, 2016).

In view of the scenario of generation of REEEs, and their environmental impacts, in order to minimize their consequences, some alternatives are being established, either as a form of environmental programs, or even national and international laws / guidelines. The indication of actions that minimize the negative environmental impacts, presentation of viable solutions, represent the significant importance on the subject, some of these actions are presented below.

4.2 ENVIRONMENTAL ACTIONS

There are several debates about the environmental impacts resulting from electronic waste, as well as a survey of actions that aim to minimize these injuries. The following are some of the main environmental actions, within the international panorama, which are concerned with the generation of WEEE and the reduction of its impacts on the environment, which can be better understood according to Table 02.

Chart 02 - Overview of international actions aimed at the problem of electronic equipment.

Actions	**Description**
EPA - Environmental Protection Agency	Since 1970, its concerns are focused on monitoring, setting standards and establishing measures to guarantee the environment. Its main themes are related to combating climate change and improving air quality; protection of water as a precious asset and limited resource and working towards a sustainable future. (EPA, 2018)
EPEAT - Electronic Product Environmental Assessment Tool	It adopts criteria of: longevity, reuse, recycling, packaging, savings and energy and management at the end of its useful life. Together with the IEEE - Institute of Electrical and Electronics Engineers, the adoption of an American national standard (EPEAT, 2018) emerged.
REEE directive - Waste of Electrical and Electronic Equipment	2003 - REEE collection system, at no cost to consumers. Its basis corresponds to the precautionary principle, preventive action taken and that environmental damage must be corrected and paid at source. That is, the polluter must be responsible for the life cycle of their products, bearing all costs of collection, transportation, treatment and recycling services (REEE, 2016).
EPR - Extended Producer Responsibility	2002 - environmental policy with responsibility extended to the producer of its products. This practice implies the responsibility of the producers in the collection of their products, to carry out the treatment for eventual recycling processes. Represents an important support instrument in the implementation of the management of REEEs, has as priority the prevention, reuse and recycling of this waste (EC, 2014).

Source: Leinig (2018).

Still within the alternatives of minimizing the environmental impacts caused by the REEEs; some examples of reverse logistics in Brazil and in the city of Curitiba / PR, can be seen through Table 03.

Chart 03 - Overview of national actions aimed at the problem of electronic equipment.

Actions	**Descriptions**
Jogue Limpo Program	It was launched in 2005 in Rio Grande do Sul, by the National Union of Fuel and Lubricant Distribution Companies (Sindicom). This system relates 15 units of the federation, with more than 30 thousand service and sales posts, with the collection of 15 thousand tons in nine years. This system consists of the disposition of 57 special collection trucks, the processing of these packages is carried out in 21 receiving centers and finally the forwarding to the appropriate plastic recyclers (NOEL, 2014).
Cataforte Program	According to the Federal Government of Brazil (2014) - Sustainable Business in Solidary Networks, it started in 2009 with the encouragement of groups of waste pickers based on principles of solidarity economy, with the training for the structuring of collection units and activities in the area. The second phase of the program was carried out in 2010 with the solidarity logistics process, with the strengthening of the logistics infrastructure, with the acquisition of 140 trucks for 35 networks of cooperatives and associations of waste pickers, carrying out training and providing technical assistance in logistics planning. The third phase took place in 2014 with an investment of R $ 200 million in ventures for recyclable collectors, facilitating the entry of new cooperatives in the recycling market and in the solid waste chain.
State Plan for Integrated and Associated Management of Solid Urban Waste of Paraná (PEGIRSU)	In order to implement the National Solid Waste Law, the state of Paraná is working on the goal of ending open dumps through the State Plan for Integrated and Associated Management of Solid Urban Waste in Paraná (PEGIRSU), encouraging recycling , as well as the reuse of waste, foster the formation of cooperatives of environmental agents, with the generation of income jobs in the 399 municipalities of the state (PEGIRSU, 2013).
First Station of Sustainability	Implemented in 2014, located in the Boa Vista neighborhood, it aims at the voluntary collection of recyclable waste by residents of the immediate area, aims at improving the solid waste management system, improving selective collection and creating mechanisms for social inclusion, with the collaboration associations of waste pickers. The Station is open 24 hours and receives twelve types of recyclable materials and in 2014 it collected 306 tons of this type of waste. The program must also expand to 75 locations more (PMC, 2014).
Paraná without Dumps	It aims to implement reverse logistics in companies that generate various types of waste, with the objective of guaranteeing the productive sector, in the collection and correct disposal of the waste generated by them and that are disposed on the market (PEGIRSU, 2013).

Source: Leinig (2018).

In the city of Curitiba / PR, data from the Secretariat for the Environment and Water Resources (2015) show that, in the state of Paraná (out of 399 municipalities), 65 % dispose of their solid waste in landfills. Curitiba was the first city in Brazil to implement a selective collection program, with the home collection program “Lixo que não é Lixo” in 1989.

According to PEGIRSU (2013) the average per capita generation of solid urban waste (MSW) in the state of Paraná is 0.9kg / inhab. day, resulting in the generation of 3,450,000 tons of this waste annually. Less than 30 % of all 399 municipalities in the state of Paraná sort dry recyclable waste, most of these locations, about 53.6 %, still adopt inadequate techniques for final disposal of their waste, in controlled dumps or landfills.

Among the actions reported here, there is a general trend with the implementation of reverse logistics systems. In addition to a convergence in the responses of the actions, regarding the establishment of the LR, one must consider the existence in a larger scope, referring to the fulfillment of the PNRS, subjects proposed and reported below.

4.3 REVERSE LOGISTIC (LR)

The determination of Reverse Logistics processes can represent the leadership position of a company in the market, triggering sustainable competitive advantages, in comparison to its competitors. Conceptualizing Reverse Logistics, refers us to the existing studies of several researchers on the theme, in this way it is possible to establish a more assertive approach on the different approaches on its concept.

The oldest definition of reverse logistics (LR) was developed by Zikmund and Stanton (1971), reverse distribution, in the opposite direction, according to the need to collect solid materials, resulting from post-sale and post-use processes, for its reuse by its manufacturer.

The most significant factor within the LR processes represents the need for extreme control, especially when there is any liability for damage to health. Therefore, product withdrawal programs must be seen as a service strategy, aimed at customers and must be implemented regardless of their costs (BOWERSOX; CLOSS, 2001).

According to Leite (2003), the LR represents an area of activity that coordinates operations, physical flow of information about a product, which in some way or cause, are eliminated by society. In this sense, its focal reason is to add value to this product, which can be classified according to its state, conditions and the end of its useful life.

Sharma *et al.,* (2007) expand bringing the purposes of LR, through the movement of the product in its final state, for the return of the business cycle or for its proper destination. The reverse logistics proposal, also known as green logistics, can be translated as a strategic advantage, with a strong link between solid waste management and its logistics process.

For BRASIL (2010), the LR represents a tool for social and economic development. It encompasses actions, procedures and instruments for collecting and returning solid waste to companies. Finally, the reuse of these residues, within their cycle or in other productive cycles, and also, their final destination in an appropriate manner.

Studies by Rocha and Gomes (2009), in Minas Gerais, point to the need for improvements in the management of electronic waste, with the definition of well-defined policies for the reduction of potential environmental impacts, with the effective production of producers, importers and distributors of EEEs, consumers and users (general population), involved in the collection processes, companies, entities and associations related to disassembly activities, refurbishment recovery (collection center, recyclers, technical assistance, scrap dealers) and groups involved in related activities with the final disposal of the products (City Halls, public and private companies).

According to Ravi et al. (2005), the LR of computers, has as main objective, the creation and establishment of optional paths, actions for the products at the end of their useful life. Some of its main components can be directly recovered, such as the motherboard, which can be used in electronic toys, instead of being disposed of in landfills as waste and as a consequence causing environmental impacts.

Studies by Ciocoiu *et al.,* (2010), in Romania, point out that although the number of people who “keep” non-operational products in their homes has fallen, many people are still unaware of the disposal alternatives. They should be attracted by proposals for discounts on the purchase of new equipment and the collection of old equipment from their homes.

Much of the Romanian people are attracted by discount campaigns on new equipment, with the delivery of the old device. On the other hand, 90 % of respondents in the same survey conducted by Ciocoiu *et al.,* (2010), demonstrate the importance of selective collection of electrical and electronic equipment, but are only willing to

adopt an environmentally correct behavior, as this does not require much effort on their part.

A very similar behavior can be seen in the studies by Chung *et al.,* (2011) held in Hong Kong, which indicates that the most perceived trends were: sale or donation of REEE to collectors; the exchange of the old for a new one.

As verified, there are great constructive efforts for environmental actions with the purpose of minimizing the environmental impacts caused by the improper disposal of the waste of electronic equipment. In Brazil, one of the main milestones with this objective, represents the National Solid Waste Policy (PNRS). The establishment of the PNRS emerges as an instrument of a series of negotiations, with the objective of solid waste management, aiming at reducing its effects. and environmental impacts, these issues, main fundamentals and purposes are discussed below.

4.4 NATIONAL SOLID WASTE POLICY (PNRS)

One of the biggest and most expressive evolutions in institutionalization regarding the treatment of solid waste, occurred by the establishment of the National Solid Waste Policy (PNRS). Here we have the establishment of a conscious management of solid waste, being strongly trimmed with the use of reverse logistics processes.

The National Solid Waste Policy (PNRS) (Brazil, 2010) was enacted on August 2, 2010 by Law No. 12,305, representing a Brazilian landmark related to environmental issues and the treatment of urban waste. Its conception encompasses the integrated management responsibility, the shared responsibility over the life cycle and the environmentally correct management of solid waste, and among the actors of the market in question, being: industry, government, commerce, service providers, importers and consumers. It also establishes plans, programs, objectives and deadlines for these actors, with the purpose of correctly disposing of solid waste, including REEEs (Waste Electrical and Electronic Equipment).

The principles established by this law, can be observed through Art. 6, Annex A. Its main considerations, related to this research, can be perceived through the following points: I - the polluter who pays and the protector who receives; VII - the shared responsibility for the products' life cycle; X - society's right to information and social control.

BRAZIL (2010) it also defines LR as an economic and social instrument, determined as a result of actions, procedures and destination. Its objective represents

the realization of a collection and refund to the solid waste business sector, enabling the reuse, in its cycle or in other productive cycles, or even environmentally appropriate final destination.

In this conception, PNRS, institutes the realization of LR, of which the agents participating in the market must cooperate for an environmentally appropriate destination of products at the end of their useful life. In this way, the LR represents a mechanism that enables recycling, reinsertion and reuse of solid waste processes in the production chain. Listing the perspective of the social dimension, it also maps the recycling and participation of waste pickers, organized in cooperatives (BRAZIL, 2010).

For the implementation of an LR system, manufacturers, importers, distributors and traders can still:

1). Establish procedures for the purchase of used products or packaging, implantation of recyclable and reusable waste delivery points and establish partnerships with cooperatives or associations of waste pickers. Consumers, in turn, must return their products and packaging after use, to distributors and merchants (BRAZIL, 2010);

2) Manufacturers, importers, distributors and traders of pesticides, batteries, tires, lubricating oils, fluorescent lamps and electronic products, are responsible for: reuse, recycling or disposal facility, environmentally friendly, as well as in their manufacturing process, reduced generation volume of solid waste. They must also inform ways to avoid, recycle and dispose of solid waste associated with their products. (BRAZIL, 2010);

3) Instituting shared responsibility, as the result of the correct disposal of solid waste depends on the action of the actors involved in the chain: manufacturers, the public sector, commerce and consumers, for progress in solid waste management in Brazil (DEMAJOROVIC; MIGLIANO, 2013).

There are still major challenges to the effectiveness of the PNRS Law, such as overcoming the resistance of the business sector to defray adequacy for this process, in addition to the specific characteristics and complexity of the reuse processes, emphasizing computers. This factor is due to the composition of this equipment, which has a range of materials, some of which may have toxicity, heavy metals, but on the other hand they are also compounds with great economic interest: gold and silver (DEMAJOROVIC; MIGLIANO, 2013).

The existence of the PNRS represents a way of responding to the problems faced by the inadequate handling of solid waste, with consequences in environmental, social and economic aspects. However, this scenario is originally designed, by the generation of this waste itself, as clarification and details, the item below describes this subject specifically for the electronic equipment.

With all the themes brought up to date, the importance of raising awareness about environmental issues is evident, gaining more strength thanks to environmental awareness. This scenario is constructed, either in the form of positioning / personal posture, or represented by the dynamic movement of the business sector.

CHAPTER 05
CONSIDERATIONS ON ENVIRONMENTAL ASPECTS AND ISSUES

Addressing environmental issues, with a focus on the possibility of actions to minimize the environmental impacts caused by electronic waste, leads us to the questions of environmental awareness. These debates are gaining more and more prominence, thanks to their significant increase in everyone's environmental awareness, perceived from individual and / or collective actions, or even the adoption of objectives, goals and establishment of strategies, which deal with environmental actions in organizations.

5.1 DIMENSIONING AND ESTABLISHING SUSTAINABLE STRATEGIES

There is a continuous increase in the number of organizations that incorporate environmental practices, into their business plans and daily operations. Several initiatives are translated as incentives for companies to become more environmentally positive.

Organizations are responsible for sustainability, protection of the environment and have obligations with regulations regarding energy consumption, water costs, greenhouse gas emissions and waste disposal. The most appropriate way in face of such scenario corresponds to the establishment of an environmental management, the quality of the environment must be preserved, with expectations resulting from a sustainable environment (CHOU, 2012).

Sarkis (2003) mapped out five purposes of environmental practices: reducing, reusing, remanufacturing, recycling and disposal options. Some of these initiatives are mandatory, resulting in regulation programs, in contrast, the voluntary actions of environmental programs implemented by companies, are increasingly significant. Corporations can place these environmental programs, within the perspective of technological projects, with the objective of gaining or maintaining a competitive advantage (SARKIS, 2003).

For Lunardi *et al.,* (2014) the question of competitive strategy, is centered on the balance of economic and environmental performance, at the same time green and competitive. Organizations increasingly feel the constant pressure from customers,

competitors, regulations and the community in general, to adopt and implement business practices with environmental concerns.

The relationship between environmental performance and green represents a matter of business strategy. The establishment of these strategies, effectively and with the objective of achieving green adoption more quickly, requires an understanding of the behavior of people, groups and organizations in society (GHOLAMI et al., 2013).

The researchers Dolci *et al.,* (2014) concluded that the results of environmental sustainability practices, are usually established in organizations as a means of economic advantage, thus, the emergence of the environmental dimension has its consequences resulting from the changes resulting from the development of the economic dimension.

The integration of different sustainable management perspectives focuses on the development of sustainability capabilities, not only focused on the environment and people, but also on the management of business value. These factors, which can increase profitability and gains with competitive advantage, supported by themselves (DAO *et al.,* 2011).

However, studies by Bengtsson and Ågerfalk (2011) in Uppsala (Sweden), found that the resistance found in organizations, represents the need for changes in existing routines, as well as in the organizational structure itself. This requires a complete review of the organization's routines and standards for the successful implementation of sustainability initiatives. The appropriate solutions found, must count on the involvement of all interested parties.

On the other hand, in the same study, researchers Bengtsson and Ågerfalk (2011) identified that information technology practices have a fundamental role, as active in innovations and changes in sustainability. This results from the inclusion of sustainability indicators in these systems, which can serve as a basis for corporate initiatives.

Many organizations, with the establishment of strategies with environmental purposes, end up adding in their principles and goals, an adoption of Environmental Management. The consolidation of environmental quality in business processes can generate prominence in the market, solidify its positioning and enhance the corporate image with environmental concerns.

5.2 CORPORATE ENVIRONMENTAL QUALITY AND PERSPECTIVES OF ENVIRONMENTAL MANAGEMENT WITH A FOCUS ON TIV

The issue of environmental awareness, its growth and advancement, whether due to the assessment of the problem, or pressures exerted by different means, in search of sustainable development, also requires conceptual changes in corporate environmental management. In this context, more and more organizations are beginning to emerge to align their strategies, with the promotion of actions focusing on sustainability issues, mainly with the adoption and establishment of Environmental Management.

According to Mann e*t al.,* (2009), from 1990 onwards, environmental management became a subject of great interest for researchers and managers. Specifically, TIV was recently included as a tool, combining environmental issues together with commercial advantages. Its concept is aimed at practices of environmentally positive IT activities, combined with the promotion of business goals of organizations. TIV represents a fit between axes of environmental and social motivations, bringing satisfactory advantages for both segments.

Organizations are responsible for sustainability, protection of the environment and have obligations with regulations regarding energy consumption, water costs, greenhouse gas emissions and waste disposal. The most appropriate way in the face of such a scenario is the establishment of environmental management, where the quality of the environment must be preserved, with expectations resulting from a sustainable environment (CHOU, 2012).

The integration of different sustainable management perspectives focuses on the development of sustainability capabilities, not only focused on the environment and people, but also on the management of business value. These factors, which can increase profitability and gains with competitive advantage, supported by themselves (DAO *et al.,* 2011).

Molla (2008) deals with Green IT indicators from different perspectives, namely: of operation (Energy Efficiency and reduction of greenhouse gas emissions); service perspective (Green IT to support the sustainability of business initiatives, management of the green supply chain, environmental management and reduction of carbon emissions) and finally the perspective of the end of green life (processes of reuse, recycling and disposal of hardware).

Studies by Bengtssaon and Ågerfalk (2011) in Uppala (Swedish municipality), found that the resistance found in organizations, represents the need for changes in existing routines, as well as in the organizational structure itself. This requires a complete review of the organization's routines and standards for the successful implementation of sustainability initiatives. The appropriate solutions found, must count on the involvement of all interested parties.

Notes from Mishra *et al.,* (2014) indicate that IT professionals demonstrate positive intentions regarding aspects of the IVT and that they actually adopt green practices in their work. They also conclude that issues such as personal beliefs and the level of awareness have a significant impact on the adoption of the TIV attitude.

On the other hand, in the same study, the researchers identified that information technology practices have a fundamental role, as active in innovations and changes in sustainability. This results from the inclusion of sustainability indicators in these systems, which can serve as a basis for corporate initiatives.

Permeating these concepts, and advancing a little more in our debates, we can go deeper into the concepts of Green Information Technology, which also represents a considerable minimizing alternative to environmental impacts. Here we consider mainly processes concerned with the acquisition, optimization of the use and performance of technological components and disposal, actions always with environmentally correct concerns.

5.3 GREEN INFORMATION TECHNOLOGY (TIV)

Information Technology represents a fundamental "piece" for the survival and support of an organization. The result of the set of hardware, software, processes, user networks, performance, assists in the form of data treatment, that is, the ability to store, protect and manage data. Considering environmental concerns, much has been debated about TIV, where there is a set of environmental concerns, from its composition of the physical structure, its acquisition, use and disposal.

The emerge of TIV for Nunes *et al.,* (2011), aims to mitigate the problems caused by technology and their respective environmental impacts, from the demand for the use of electric energy to the use of materials for the manufacture of products. TIV, according to Jenkin *et al.,* (2011), refers to principles and programs, which in a certain way, directly or indirectly deals with environmental sustainability within the business environment.

"Green" information technologies and systems promise good results to address environmental issues more widely in organizations. Its use can, in a way, minimize direct negative environmental impacts and contribute to mitigating actions for environmental degradation (JENKIN *et al.,* 2011). The environmental gains within the strategies of TIV, according to Wang (2012), can be translated as: the use of the application of centralized data centers, management of the consumption of clean energy and the recycling of computers at the end of its useful life.

The relationship between organizational performance and green represents a matter of business strategy. The establishment of these strategies, effectively and with the objective of achieving green adoption more quickly, requires an understanding of the behavior of people, groups and organizations in society (GHOLAMI *et al.,* 2013).

In this regard, Lunardi *et al.,* (2014) considers that the issue of competitive strategy is centered on the balance of economic and environmental performance, at the same time green and competitive. Organizations increasingly feel the constant pressure from customers, competitors, regulations and the community in general, to adopt and implement business practices with environmental concerns.

In these considerations, in the studies carried out by Jenkin *et al.,* (2011), motivating forces that influence the environmental sustainability strategies in organizations were identified, which are: organizational, regulator, socio-cultural, ecological and finally technological.

Therefore, Information Technology (IT) can be seen as causing environmental problems, but it can also be interpreted as a solution for sustainability. During the manufacturing and disposal process, Information Technology reproduces a source of environmental contamination, in contrast, it also presents possibilities for efficiency improvements in the use of resources and ecological opportunities for several companies (Wang *et al.,* 2015).

Molla (2008) highlights the Green IT indicators from different perspectives, namely: of operation (Energy Efficiency and reduction of greenhouse gas emissions); service perspective (Green IT to support the sustainability of business initiatives, management of the green supply chain, environmental management and reduction of carbon emissions) and finally the perspective of the end of green life (processes of reuse, recycling and disposal of hardware).

Research developed by Bengtssaon and Ågerfalk (2011) in Uppala (Swedish municipality), found that the resistance found in organizations, represents the need for

changes in existing routines, as well as in the organizational structure itself. This requires a complete review of the organization's routines and standards for the successful implementation of sustainability initiatives. The appropriate solutions found, must count on the involvement of all interested parties.

On the other hand, in the same study, the researchers identified that information technology practices have a fundamental role, as active in innovations and changes in sustainability. This results from the inclusion of sustainability indicators in these systems, which can serve as a basis for corporate initiatives.

Studies by Mishra *et al.,* (2014) indicate that IT professionals demonstrate positive intentions regarding aspects of the IVT and that they actually adopt green practices in their work. They also conclude that issues such as personal beliefs and the level of awareness have a significant impact on the adoption of the TIV attitude.

The growing concern with environmental issues, influences new thoughts and behavior, both on the part of people, as well as changes in business posture. This change allows and opens space for new perspectives, which we can consider as the establishment of a new conduct, positioning and green posture.

5.4 GREEN POSTURE - NEW PERSPECTIVES FOR CLIENTS AND COMPANIES

More and more consumers and industrial and business sectors are more sensitive about environmental aspects, with this, a new conception, posture and perspective are born that aim at the pursuit of sustainable development purposes. Mainly for the business sector, following and being aware of this change, becomes essential for its maintenance and positioning in the market.

According to Leite (2003), the consumer is more sensitive and needs information on the environmental impacts of certain products and services. For Kanchanapibul et al. (2014), with increased environmental awareness, consumers are more sensitive to green products, when making their purchase decisions. However, people who have more ecological knowledge are more likely to make green decisions and conclude that younger generations are more connected with environmental issues and green products.

Within the considerations of Jenkin *et al.,* (2011), the approaches of business strategies according to the classifications: - Image-oriented only: they involve environmental concerns aimed at the environment, publicly bringing the company's environmental policies; - Eco efficiency, bring prevention and control as keywords.

These perspectives involve the efficient use of natural resources, caution and monitoring in relation to waste; - Product Management, Eco capital: encompasses negotiations to achieve the goals, together with the minimization of environmental impacts throughout the life cycle of a product (product management) - balance of society's needs, in the short and long term, according to natural resources; - Eco-efficiency (sustainable development): involve the two strategies above, with additional environmental sustainability throughout the entire process of the company's activities, the corporation's commitment to stop environmental degradation.

To complement this scenario and still within the considerations of Jenkin et al. (2011), the internal organizational forces, are evaluated and described as: internal public (employees), capacities, structures, policies and financial factors. On the other hand, external forces: Market regulation forces: encompass the rules, regulations, external laws and market pressure; Sociocultural forces: reveal environmental values, beliefs and purposes of society; Ecological and technological forces: natural and artificial resources that are available to the corporation, as well as their influences on organizational decisions in search of environmentally sustainable actions.

Within this scenario, the concern with the purchase of products related to environmental responsibility is verified in the profile of certain consumers. This new stance is perceived, with the requirement for green labels and certain company stances, mainly with attitudes towards sustainability concerns linked to environmental issues (CIRIBELI; MENDES, 2014).

For environmentally concerned companies, it means raising their real feelings about environmental issues. In addition to understanding and understanding the perceptions and behavior of consumers, companies must also adopt the development of sustainable strategies, in order to obtain the effectiveness of the green resource over time (KANCHANAPIBUL et al., 2014). Increasingly the concern of consumers, industries and suppliers, can be perceived by theirs with their demands turned to: quality, cost, service and environment (MAITINO NETO: SILVA, 2011).

For Lunardi *et al.,* (2014), customers with sustainable concerns, are responsible for pressures on manufacturers and governments, especially regarding practices that have less impact on the environment.

Green companies are directly involved in the production of manufactured goods, being responsible for the achievements aimed at the benefits of the environment and conservation in the use of natural resources. In this way, corporations are concerned

with the production of products that feature the use of renewable energies, environmental control and carbon reduction, as well as the establishment and use of innovative technologies (GÖK *et al.,* 2014).

According to studies by Kanchanapibul *et al.,* (2014), who investigated the behavior and buying green by the new generation, conclude that in fact young people are engaged and concerned with environmental issues. In this scenario, it is essential for companies to adopt environmental practices and focus on providing satisfaction, in order to maintain the consumer society. While the environmental ideology is dominant, the green market will be prosperous, reaching the largest number of customers, the success of the business, needs to sustain the demand of its consumers.

According to the Ministry of the Environment (2015), the conscious consumer makes a voluntary, daily and solidary contribution, with the objective of guaranteeing sustainability and life on the planet, and that: - Takes into account, at the time of purchase, the choice of products related to issues of the environment, human health, fair labor relations, as well as the price and brand; - Represents a transforming agent in society, and that its act of consuming, has a significant impact on the environment; - It seeks balance in the act of consumption, personal satisfaction, sustainability, maximization of positive consequences and minimization of negative ones, thinking not only about itself, but also about social, economic and nature relations; - Disseminates the concept and practices of conscious consumption, through small gestures, carried out by a large number of people, causing great transformations; - Values corporate initiatives with social and environmental responsibilities, preferring corporations concerned with practices aimed at sustainability; - Practices conscious consumption on a daily basis, through gestures that take into account the impacts of buying, using or disposing of products or services, choosing companies according to their commitment to socio-environmental development.

As the whole panorama of a new positioning towards environmental concerns is shown, within the adoption of business practices, there is still the possibility, regarding the availability of green products. In this perspective, the offer of an environmentally correct product stands out, where there is caution from its conception to its disposal, with purposes and bases for the reduction of its negative impacts on the environment.

5.5 GREEN PRODUCTS

The intentions of green products are interesting from an environmental point of view, since from their initial planning, proposed in the project design stage, manufacturing processes, their use and finally their correct disposal at the end of their useful life, they are always planned and focused environmental intentions. These considerations lead to the conception and design of a new engineering, as a result of a proposal for a new product, both with environmental bases.

Navinchandra (1990) defines the green engineering project, as a consequence of an evaluation of products and methods to authenticate the simultaneous existence of environmental well-being, together with the non-compromise of the product's functions and qualities. According to Pujari *et al.,* (2003) changes in consumer attitudes and product durability, require some types of changes. Thus, the development of new products becomes a crucial factor for companies and industries, combined with marketing, technological processes, engineering and organizational structure.

Ljungberg (2005) defined a sustainable product as one that has a lower environmental impact during its life cycle. It is worth mentioning that the impact will never be null, but minimized to the maximum, allowing their comparison as similar products and the identification of more or less sustainable products. Adams (2014) describes a green product as the result of ecological technology.

According to Chu *et al.,* (2009) the structure of a product represents a critical factor, which not only for its characterization and composition, but also for the long extension of the activities involved at the end of its useful life. Thus, it must be present in the corporate strategies, recycling process and ease of disassembly. In the development of modern products, for most companies, environmental issues translate as essential and fundamental issues. During the process of developing a green product, several special procedures must be incorporated, in order to comply with some green directives (CHU *et al.,* 2009).

According to Holzmann (2010) for the design of a new product on the market, it is necessary to consider good environmental practices from the beginning of the development of this product. The development of green products represents a very important factor in our society, with its focus also on a green economy.

The design of a green product represents the combination of economic and ecological perspectives, to result in a new and functional product. Other terms also

used to describe this equipment are: green design, eco design, sustainable products, environmentally conscious products (KHOR; UDIN, 2013).

Specifically, for the success of a green product, ecologically sustainable, the communication of the attributes of the green brand must be practiced efficiently, most consumer purchase decisions are influenced by green labels, which indicate that the product has less impact on the environment (ADAMS, 2014).

According to Lopes and Pacagnan (2014), companies with sustainability concerns can develop attractive and functional products, which are less impacting social and environmentally, in addition to satisfying the relationship with the consumer. In addition to these factors, they also involve taking care of their respective packaging, with the manufacturing, logistics and post-consumption process.

According to Wang, *et al.,* (2015) for many companies, the development of a green product is incorporated into the fundamental corporate strategies, reasons that are based on regulatory requirements and the commotion of the population with the protection of the environment. A competitive strategy for manufacturers, corresponds to eco design, which meets the needs of its customers and policy makers. Factors like these specifically influence the electronics industry, which has an increasingly shorter product life cycle, leading to the demand for green product development (WANG *et al.,* 2015).

According to Ljungberg (2005) new concepts of product development projects meet current requirements, as well as environmental requirements, seeking as a result a sustainable product. Some of these design examples are listed as: modular: easy to repair and exchange components; replacement of materials; reduction of materials; disassembly; recycling and reuse.

According to Manzini and Vezzoli (2005) the eco design of a product has as strategies: the choice of processes and resources with minimal environmental impact; reduction in the use of resources (reduction of material and energy); prolongation of the products' useful life (optimization) and ease of reuse; optimization of the useful life of the materials, aiming at the valorization of the discarded materials, with productive return through the reverse chain; easy disassembly and separation of parts.

Still regarding packaging considerations within a view of environmental concerns, its characteristics (size, shape, material) have a direct influence on the offensive impacts on the planet. The incorporation of better molds in the packaging is reflected in the resulting effects on their transport - reduction in the use of materials,

optimization of storage spaces and volume and reduction in the amount of handling (SARKIS, 2003).

After studies carried out in Romania by Ciocoiu *et al.,* (2010), within several positive and negative aspects of the REEEs management system, the suggestion presented by the researchers corresponds to the reduction of the size of the electronic equipment, integrating the concept of products with the concept of eco design.

Holzmann (2010) highlights the different ways regarding the emergence of a new product in the computer company involved in the research in question, the steps are based on the technical and economic feasibility for positioning the product on the market. The steps include: marketing (market research and information gathering in the field); commercial area: information and suggestions; presidency: with the request for a new product that meets a specific market trend or determined demand; innovation center: conducts research on technological trends and solutions for the implementation of new products; new products: analyzes the behavior, desires, habits and trends of consumers and products, current technical feasibility and analysis of suppliers' proposals.

Studies carried out on the expectation and perception of green products by consumers, Tseng and Hung (2013), concluded that they expect attributes of green equipment, such as: high environmental performance, functional performance and appearance. In this way, suppliers of green products, should turn their attention to environmental attributes, as well as in the development of this equipment.

In a survey conducted in the Taiwanese electronics industry, Tsai (2012) indicated that of the 24 key factors investigated for successful new product development, the four most relevant were identified: potential for new product development; identification of favorable points internally and externally to assess competitiveness reinforcement; precision in the development of new products and acceptance of consumer preferences.

Within the research described by Agrawal and Das (2013) in India on the attitudes and green behavior of consumers, he pointed out that about 60 % of them are willing to pay up to 10 % more, for a green product. They also point out that the main advantage perceived by consumers in using a product concerned with environmental issues, about 42 % indicate the reduction of pollution, as the main factor.

Specifically in Brazil, Tomasim *et al.,* (2013) in their investigations verified the need for suppliers of green products, in the first place, that the strategies adopted for the sale of non-green products, cannot be the same employed in the design of green products, at this moment it is necessary greater investments, especially in the initial commercialization phase. The second point pointed out by the researchers, converges that the suppliers of green products, should not expect that the superior characterizations of these products, will generate their sales.

According to Jaiswal *et al.,* (2015) people's growing awareness of the negative effects on the environment of solid waste is increasingly demanding environmentally friendly products. The need to manufacture a green product, the development of a sustainable product, represents an increasing need.

Jabbour (2015) extends the perspectives of launching a green product, which also represents a fundamental step, for concerns related to the environment and among suppliers. Contributions are also perceived with changes in behavior within companies and for practices in the green distribution chain, with the formation of a green team, green jobs, green suppliers, facilitating the internal structure of adoption for green supply chain practices.

The business environment also demonstrates initial concerns about reverse logistical processes, either through objectifying its corporate image, or through real concerns with the environment or by normative and / or legislative pressures. The importance of adopting a reverse logistics, aiming mainly at the shared and adequate management of products, can lead us to more daring questions, thus envisioning the maximization of this symbiosis: the integration of Reverse Logistics practices, with the purposes aligned with the offer of a green product.

5.6 INTEGRATING LR - GREEN LOGISTICS CHAIN AND GREEN PRODUCT PRACTICES

The choice to incorporate LR processes into the organizational routine represents a certain future, at some point companies will have to readjust to these processes, if they are not already doing so. The adoption of LR practices results in increased competitiveness, mainly in the form of being a differential, mainly in the eyes of environmentally conscious consumers, or in compliance with legislation.

Pujari *et al.,* (2003) considers that the development of a new product, should have its objective focused on the design of a product with characteristics directed to the desires of its consumers and the group involved. The careful study must be carried

out, based on the selection and definition of product attributes, such as: ease of use, quality, price, safety and aspects related to environmental concerns.

Sarkis (2003) projects that a system that encourages the adoption of returnable packaging, will require a strong establishment in the supplier and customer relationship, as well as an effective LR model.

According to Khor and Udin (2013), green supply chain management practices can be translated with the application of an LR system together with the design of a green product. These attitudes are the result of companies' commitment to environmental sustainability. The generation of REEEs requires recovery to be viable. The LR process options are based on the value of the waste, that is, the re-entry of products and recyclable material, again within the supply chain (KHOR; UDIN, 2013).

According to Dwivedy and Mital (2012), the central point of the competition for new products is centered on the ideas of reform and reuse. Well-organized product return strategies, with the objective of recovery and quality assurance, should be part of business concerns. In this way, the use of LR according to Khor and Udin (2013) as a positive result of reducing ER, can be practiced with changes made in product designs, in order to facilitate their partial or total recovery.

In the studies by Khor and Udin (2013), the empirical results demonstrate that green product designs are vital to the contribution of the recovery capacity of this equipment. Projects aimed at ease of disassembly are well ahead of simple projects concerned with the use of recycled materials. This type of planning aims at product performance for the environment, with concerns of reducing negative environmental impacts related to REEEs.

The design of a green product goes beyond the elevation of the company through its environmental reputation, it is related to the ease of recovery of the product, through modifications within its manufacturing process. Considerations of accessibility and ease of disassembly, for the extraction of subassemblies that can be reused, are strongly based on perspectives of repair, reconditioning, remanufacturing and possibilities of recycling the product (DWIVEDY; MITAL, 2012).

The production processes that determine ecological factors within the supply chain, on the other hand, can be translated into competencies within processes in the use of certain materials, the ability to aggregate reusable elements or with the possibility of recovery in the disassembly process, as well as the concern with relation to waste prevention (SARKIS, 2003).

Santos and Marins (2015) suggest the integration of an LR management model and electronic equipment such as the use of information and communication technology, QR Code Figure 04. Currently widely used by print media, the suggestion of this study directs its use with a tool assistance in handling and producing equipment. They also suggest the creation of a portal using the web, for the integration of end consumers, distributors, retailers, manufacturers, cooperatives and government entities, who would be responsible for maintaining and updating the portal.

Figure 04: QR Code

Source: EPO (2016).

In this portal, manufacturers practicing their participation and contribution with the PNRS, would have obligations to update the addresses and available ways to carry out the disposal of their products in an environmentally correct manner, through the use of the QR Code and on the website the available links. Extending the responsibilities for the destination of RS, consumers should consult the disposal addresses and proceed with the proper disposal (SANTOS E MARINS, 2015).

The application of this model results in the ease of managing operational flows, protecting the environment, generating and growing competitive advantages, in addition to mitigating losses related to current legislation and ensuring economic viability. So far, we have presented the entire topic of LR and TIV, where it is possible to discuss the perspective of integration of these two spheres, aiming and further enhancing this connection on environmental aspects.

The adoption of the combination of reverse logistic processes with the possibility of using green products, triggers the demand for new planning and possibilities in the direction and establishment of business strategies, as we will see below.

CHAPTER 06
NEW GREEN POSSIBILITIES AND STRATEGIES

The market needs to be in constant change, mainly in response to new demands, meeting the needs of consumers in addition to complying with current legislation. The concern with environmental issues is in line with the acceleration of changes frequently caused in the corporate market. In this sense, the incorporation of environmental factors in the business premises is necessary, whether they are in the mission, objectives, values, goals; note that we are always talking about strategies. The planning of business strategies related to environmental issues are essential, here we will focus on marketing strategies, because with that, we can debate (unfortunately) about a negative practice, also widely used: greenwashing.

6.1 GREEN MARKETING: INCORPORATION INTO BUSINESS STRATEGIES

Marketing is an indispensable tool in the business sector, a good marketing strategy, can generate significant competitive gains and consolidation in the market. With the growing concern of the world, regarding environmental issues, the adoption of green marketing is becoming a fundamental strategy in organizations.

According to Adams (2013) green marketing, also known as environmental marketing, sustainable marketing, corresponds to products and services, which do not produce or cause minimal damage to the environment. This term encompasses a range of activities, including product modification, changes within production processes, packaging modifications, even changes with respect to advertisements.

Green marketing represents a phenomenon that is rapidly gaining its importance in the market. He modified the forms of commercialization, as well as the tendency of companies to adopt environmentally correct concepts. Consumers are also becoming increasingly concerned about purchasing products related to environmental issues. In this scenario, companies face two dilemmas: balance between the needs of this consumer with the use of environmentally fewer offensive materials, with low cost (AGRAVAL E DIAS, 2013).

Most people believe that green marketing refers to the promotion or advertising of products with environmental concerns: recyclable, refillable, concerned with the influence on the ozone layer. However, Adams (2014) reinforces that the concept of

green marketing goes beyond these proportions, it can be applied to consumer goods, industrial goods even associated with services.

Adams (2014) analyzes that the promotion of environmentally safe products and green marketing started in 1980, in Europe, when certain substances were identified as harmful to the atmosphere. In this way, new green products reach the market as being less harmful to the environment. In this scenario, companies are forced to quickly accept these changes and incorporate environmental concerns, environmental management systems and waste minimization into their activities.

Green marketing deals with four dimensions: price, product, place and promotion. When dealing with the product dimension, its beginning corresponds to conceptions of a project aimed at consumer demand. The price of a green product to be accessible to the consumer, even though it is perceived that most consumers will pay an additional price, when perceived the sustainable value of the product. The promotion corresponds to the company's advertising with its environmental concerns. The square has to do with the product's distribution channels, customers must be certain of the ecological nature and that the product is in constant regulation as the length of distributions less offensive to the environment (ADAMS, 2014).

Adams (2014) also establishes that green marketing as a tool for protecting the environment for future generations, according to the growing environmental concern, a new market appears, the green market. Companies that wish to survive in this scenario need to incorporate environmental issues into their business aspects. Consumers identify more with organizations for these purposes and are willing to overpay for a greener lifestyle. In this sense, green marketing is not only a tool for environmental protection, but also a revolution in business marketing strategy.

As the concept of sustainability has become an important issue for companies, there is also a need for measurement, control and comparison of efforts related to this area. AlChE (2016) suggests the sustainability index, through seven metrics, which assess a company's sustainability performance, which can be perceived by its customers, community and shareholders. Strategic commitment: sustainability reports, goals and programs; Sustainability innovations: the company's commitment to research and development, sustainable products and processes; Sustainable performance: concern with the use of natural resources, use of alternative sources of energy, concerns with the emission of greenhouse gases, emission of hazardous waste; Safety performance: employees, processes; Product management:

management, risk communication; Social responsibility: extension of programs, development projects; Value chain management: environmental management systems (EMS), policies and procedures related to suppliers with sustainable concerns.

Many companies making use of green labeling, of which they want to show a false concern with environmental issues, adopt improper practices. These conducts have the purpose of deceiving or tending the conscious consumer, to the acquisition of an illusory product, that is, in practice the product does not truly represent its environmental intention.

6.2 GREENWASHING: MISUSE OF THE GREEN MASK

The term “Greenwashing” does not represent a recent term, it gained wide recognition in the mid-1980s, as being practices of executing abusive or exaggerated practices of sustainability, in an attempt to conquer space in the market (DAHL, 2010).

Greenwashing represents any practice of a product on its environmental or social attributes, performed in a misleading way, within the perspectives of Social and Corporate Responsibility (CSR). A good knowledge of the reaction of consumers to these misleading advertisements should help and reduce greenwashing behavior (BAZILLIER AND VAUDAY, 2013).

The term greenwashing or “green wash” has been widely discussed within the conceptions of companies' green marketing. They represent resources used for advertising concerned with environmental practices, where in fact it has actions that contradict the interests of concerns with the environment. It deals with the use of concepts to build a publicly reliable image, but which does not represent the real performance of its management, in this case, with negative representativeness and resulting from environmental degradation. Importance with environmental factors is reflected in the production of goods, choice of project, environmental certifications. Consumers must distinguish these false strategies from the initiatives adopted with environmental coherence (RIBEIRO AND EPAMINONDAS, 2010).

Reilly and Hynan (2014) through their studies report some recommendations for communicating sustainability initiatives, they are: industry segment (different industries face different sustainability challenges, in this sense care must be taken when comparing sustainability in different sectors) ; report effectively concrete results (even if the sustainability data are not standardized, the data must be specific and report the company's real achievements); avoid greenwashing; awareness of reputation risk;

consider the company's internal public and its sustainability message; use the best practices of social networks; and always be up-to-date on changes in corporate communication (constantly checking for rapid changes in social media and assessing sustainability performance).

Specifically in Brazil, surveys carried out by Market Analysis (2015) indicate that in the last five years there has been a growth of almost five times, representing 478 %, of the products that call themselves green, in terms of packaging less impacting to the environment, this number was almost three times higher, with a growth rate of 296 %.

Since the first edition of the survey conducted in 2010, comparing these data with the 2015 edition, there has been a growth in products that show green appeal from 408 to 2,358, respectively in the analyzed editions. In 2010 the visual appeals (image, symbols, drawings) were 781, in 2015 this number increased to 3,089 environmental appeals. For the electronics category, it was noticed that the number of environmental appeals registered in 2010 was 28, increasing to 301 in 2014.

The vast majority of consumers are unaware and do not understand the concept and practices of greenwashing, there is still an increasing number of companies that call themselves “green”. The study of greenwashing practices also shows, according to Razzolini and Leinig (2019), an increase in the number of product packages that bring information related to an environmentally favorable attitude. These facts show the incorporation of these practices in business strategies.

Throughout the various topics presented, it was possible to map the entire panorama since the generation of electronic waste, its composition, its impact in a negative way on the environment, considering mainly the issues related to its improper disposal. Given the due importance on environmental aspects, we can proceed to the second block of this book: the investigation of these factors on electronic manufacturers' websites, emphasis on computers. The verification of the manufacturers' effective attitudes and behavior, aiming at their commitment to sustainable development, based on the availability of information. We will then start with a brief explanation of how data recovery research on electronic sites occurs.

CHAPTER 7
RESEARCH AND INFORMATION RECOVERY ON SITES

The development and use of technological tools are done in an almost essential way and present in the lives of almost everyone in society. One of the most used ways in the search for information, they are easily perceived, in the use of devices and research in web sites. Following, the aspects that govern the informational search are presented, how the behavior of the users performing the search is established and how these conceptions are perceived in the web universe.

Ferreira (2003) highlights that any information has influence of three aspects: reliability, integrity and availability. These pillars are essential to ensure competitiveness, profitability, meeting legal requirements, and the company's image vis-à-vis the market and its customers.

Within the search for information, the user is treated as the center of heuristic procedures, as he can inquire and manipulate the various types of information. This behavior has as its purpose and base, the understanding and changes in the state of knowledge, the search strategies are oriented in a more opportunistic way, attending to interactive structures and procedures, within the relevance judgment the search steps are essential (GÓMEZ, 2004).

Researchers also differentiate the behavior of information retrieval, which has the following characteristics: it comes from a planned action of using established sources of information, it needs an initial knowledge of the information, the search points must be translated into a strategic language search.

According to Gómez (2004), an information system aims to provide structured control and access to information sources. It constitutes a process with two fundamental stages, the first refers to the formalized language of the system (metadata), the second represents the concern to homogenize and regulate the use of languages, their sources and users. It has it bases in the establishment of a systemic language, considering economic and technological aspects. Within electronic environments, changes in the behavior of access to information must be noticed.

Rosenfeld and Morville (2006) point out that for the planning and organization of information on a website, the professional must enable access to the content of the website in different ways, allowing the user to find what he is effectively looking for.

Within the approaches of seeking information, quality represents an essential factor. The information retrieval process is directly related to the exponential increase in the disclosures available on the World Wide Web (Web) (LOPES, 2004).

Within a search system, there is the possibility for the user to find content based on keywords, through the availability of search tools on the site. The authors also emphasize the user's expectation in offering this instrument, for this it is enough to enter the website, type the information sought, and when clicking on “search”, the appropriate and assertive answers are presented (ROSENFELD; MORVILLE, 2006).

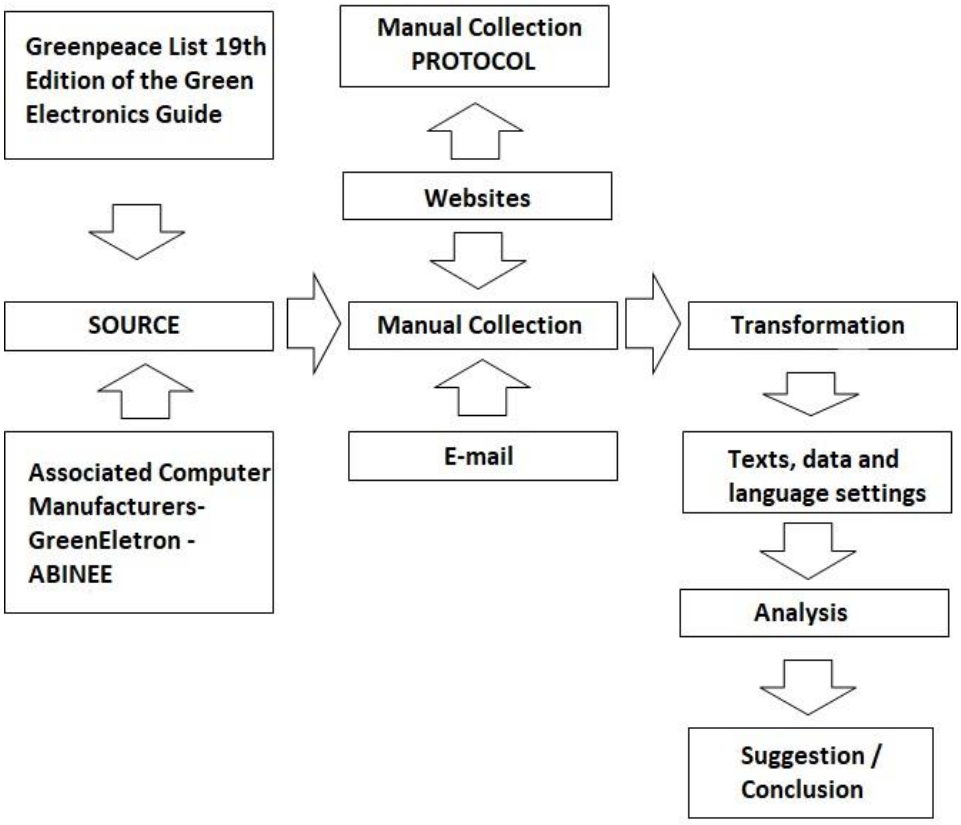
The growth of information sources on the web has triggered concerns about their attributes, as well as the interests of individuals, as actors and consumers of information. In this conception, information is mainly used according to a communicative process, where it starts through access to information in certain sources. Currently, commercial search engines represent one of the most dominant sources of information (TAYLOR, 2014).

All research and search for information can be characterized and conceived within informational processes, which are characterized and represent stages and steps architected within informational management. Understanding and detailing these steps helps to clarify and build the final product: information.

7.1 STAGES OF INFORMATIONAL SEARCH - ELECTRONIC SITES

There are several phases that constitute the stages of searching for information, it has a character in the study of the informational process, regarding the availability, transformation, adjustments and analysis of the validity of the information. The search for purposes in PNRS (Reverse Logistics) and Green Information Technology, on aspects of information management, are characterized within these processes, which can be assessed and perceived through the scheme presented through

Figure 05 - Detailing and positioning of the research stages.



Source: Leinig (2018).

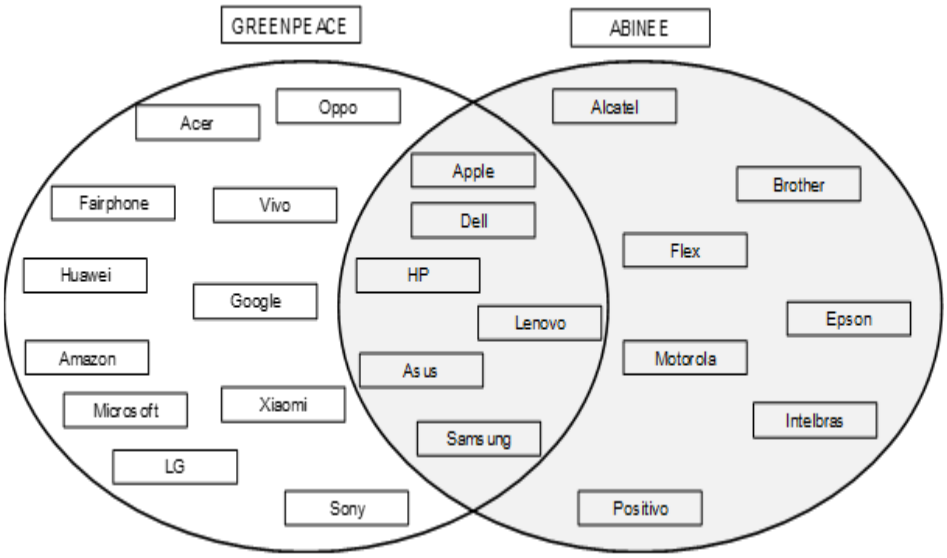
In this way, the stages of the information search can be related to the Information Management processes, where initially the choice of the source of the information search is made, the second stage is the manual collection of data. The next steps are in the transformation of the data, its adjustments, due analysis and finally the conclusion stage.

For the characterization of PNRS and TIV within the stages of Information Management, with the choice of the source of information research, the Greenpeace list of its Green Manufacturers Guide, in its 19th edition (GREENPEACE, 2017), since 2006, was selected Greenpeace publishes a ranking of green electronics companies, among the evaluated criteria there are considerations on reverse logistics and recycling of equipment at the end of its useful life, reduction of environmental impacts on the climate through its processes and products (Greenpeace, 2015).

Additionally, the associated manufacturers GreenEletron - ABINEE (ABINEE, 2016). For the stage of manual data collection, the search took place on websites, with the application of the research protocol. The next steps are in the transformation of the data, its due adjustments, due analysis. The representation in sets of the research

sources can be seen in Figure 06, as well as their intersection, in relation to the common manufacturers, which appear in both lists used as the basis of this debate.

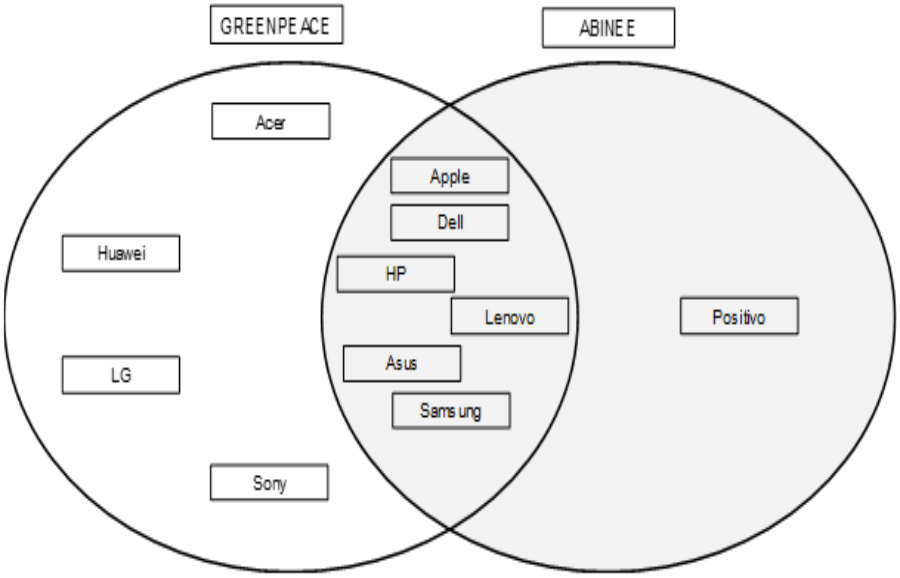
Figure 06 - Representation of intersection of sets of companies in the relationship between Greenpeace and Green Eletron associates (ABINEE).



Source: Leinig (2018).

As the foundation represents the analysis of the information made available on the websites of computer manufacturers, with that, it resulted in 11 manufacturers, the representative set can be observed as 7.

Figure 07 - Intersection representation of the sets of computer manufacturers of the Greenpeace relationship and Green Eletron associates (ABINEE).



Source: Leinig (2018).

For the collection of data on the websites of the respective selected manufacturers, considering the design of PNRS and TICV, several recurring factors were observed and can be analyzed. The selection of the main elements is characterized and referenced through criteria of notes of the main sustainability actions. In this way, it was possible to present the construction of an ordered list, according to the explanations contained in Chart 03.

Chart 03 - Selection of the main sustainability practices most cited in the literature review.

Criteria	**References**
Reverse logistic	PNRS – Only PNRS is considered because it is the informational objective of the research (BRAZIL, 2010).
Energy Efficiency	PNEf - Plano Nacional de Eficiência Energética (2018),
ISO 14001	ISO 14001.
RoHS	RoHS, (2016).
CO_2 reduction	MMA (2015).
Green Products	Pujari *et al*., (2003); Ljungberg (2005); Chu *et al*., (2009); Ciocoiu *et al*., (2010), Khor and Tsai (2012); Agrawal and Das (2013); Tomasim *et al*., (2013); Khor and Udin (2013); Tseng and Hung (2013), Adams (2014); Kanchanapibul *et al*., (2014); Lopes and Pacagnan (2014), Wang, *et al*., (2015); Jaiswal *et al*., (2015); Jabbour (2015).
Green Suppliers	Dao *et al*., (2001); Sarkis (2003), Molla (2008); Tomasim *et al*., (2013); Jabbour (2015).
Green Packaging	Sarkis, (2003); Neto (2011); Adams (2013); Lopes e Pacagnan (2014); Khor e Udin (2013); Jabbour (2015).
Easily recyclable product	PNRS (BRAZIL, 2010)
Warranty	Novaes and Zanta (2011).

Source: Leinig (2017*).*

With all the placements presented so far, we can finally present the suggestion of the protocol, which can support the informational search on computer electronic sites. This protocol was built and elaborated with the placement of criteria used in the search processes (keyword), which serve as support in the collection and analysis of the results presented. Before presenting the protocol, addressing explanations, presenting a brief description and particularities, of the words used as search words, are interesting. This understanding can help in understanding the research points with the alignment of the presented problem.

7.2 BASIS AND ASPECTS RELEVANT TO THE CONSTRUCTION OF WEB SEARCH

Within the wide range of the various studies that portray aspects of environmental concerns, sustainability, mainly based on the PNRS and TIV, there was a convergence of some present and pertinent subjects in reports of research and studies. In this way, it was possible to establish the main concepts widely questioned and listed in several reports, in the sequence these points are related, as well as their brief conceptual description.

1- Reverse Logistics - according to BRASIL (2010), this represents a tool for social and economic development. It encompasses actions, procedures and instruments for collecting and returning solid waste to companies. Finally, the reuse of these residues, within their cycle or in other productive cycles, and also, their final destination in an appropriate manner.

2- RoHS Directive - Restriction of Certain Hazardous Substances: emphasizes the need to reduce the amount of toxic substances in waste and the need to limit these substances in products and manufacturing processes. Some of these dangerous substances are: mercury, cadmium, lead and chromium. It portrays the guarantee of significant reduction of risks to human and environmental health, as well as, in reducing the negative impact on the health of recycling workers, according to the technical and economic feasibility, for the substitution of hazardous substances by safe materials. or more secure (RoHS, 2016).

3- Energy Efficiency - National Energy Efficiency Plan (PNEf), launched in October 2011, by the Ministry of Mines and Energy, the Department of Energy Planning and Development and the Department of Energy Development. Bringing the proposal to identify actions and fundraising, to encourage the legal and regulatory framework on the subject. In this way, it makes possible a sustainable market from the point of view of energy efficiency and boosting Brazilian society in combating waste of energy and conservation of natural resources. It set as a goal, in the electricity sector, a 5 % reduction in demand, until the year 2030 (MME, 2018).

4- ABNT NBR ISO 14001 – Environmental Management System, specifies aspects for the implementation of an environmental management system, which allows an organization to develop and implement policies and objectives, considering legal aspects and information on significant environmental issues (NBR ISO 14001, 2004).

5- CO_2 reduction – proposal from the Government of the Federative Republic of Brazil, presented in 2015 for the summit of the United Nations (UN), in New York. It aims to reduce the emission of carbon dioxide by 43 % by 2030, in accordance with decisions 1 / CP.19 and 1 / CP.20 (Conference of the Parties) (MMA, 2015).

6- Green Products - design of a green product, combining economic and ecological perspectives, to result in a new and functional product. Other terms also used to describe this equipment are: green design, eco design, sustainable products, environmentally conscious products (KHOR; UDIN, 2013). According to Lopes and Pacagnan (2014), companies with sustainability concerns can develop attractive and functional products, which are less impacting social and environmentally, in addition to satisfying the relationship with the consumer. According to Wang, et al. (2015) for many companies, the development of a green product is incorporated into the fundamental corporate strategies, reasons that are based on regulatory requirements and the commotion of the population with environmental protection issues.

7- Green Suppliers - as organizations are more competitive with their capabilities, according to Fu, Zhue Sarkis (2012), the establishment of an environmental supply chain, the establishment of green suppliers, represent necessary measures. Tomasim et al. (2013) in their investigations in Brazil, verified the need for suppliers of green products, first, even before strategies adopted for the sale of non-green products.

8- Green Packaging - Sarkis (2003) projects that a system that encourages the adoption of returnable packaging, will require a strong establishment in the supplier and customer relationship, as well as an effective LR model. The incorporation of better molds in the packaging is reflected in the effects resulting from its transport - reduction in the use of materials, optimization of storage spaces and volume and reduction in the amount of handling.

9- Easily Recyclable Product - BRAZIL (2010) Art. 6, item VIII - the recognition of reusable and recyclable solid waste as an economic and social value good, generating work and income and promoting citizenship.

10- Guarantee - in the context of WEEE management, objectively in post-consumer computers, the challenges translate to the strengthening of the post-consumer computer reuse market through: overcoming the attraction exerted by the consumption of new technologies (higher performance and functionalities), reduction of marketing processes such as programmed obsolescence, provision of a warranty

system and assistance with refurbished equipment (user confidence with the reused machine), incentives for users in sending their post-consumer computers to companies that prepare for reuse, as soon as it stops using the machine, with the objective of discouraging and reducing the number of storage (NOVAES; ZANTA, 2011).

With the concepts previously elucidated, we can effectively follow the presentation of the search protocol. We can also present the steps and criteria adopted for the construction of data, which support the final conclusions.

7.3 SEARCH PROTOCOL

The evaluation of the websites of computer manufacturers through informational search was directed to the application of a research protocol, which has its application validity universally for all manufacturers. This adoption aims to verify the results in an impartial and consistent manner. It is also worth highlighting the importance and relevance of the application of the research protocol, since its foundation is focused on procedures for the collection, treatment and analysis of data, enabling the verification of the information made available on the websites of the researched manufacturers.

The main contributions in the design of the protocol were based on the reading of the texts by Lunardi (2014) and Pavaneli (2015), the construction of the criteria proposed for evaluation were established through the study of the problem, according to Chart 04.

The use protocol APPENDIX A, as well as the criteria are established within a binary standard of: YES (makes information available) or NO (does not make information available). Therefore, a score was assigned to each item evaluated, where the most relevant criteria receive the highest scores. It is worth mentioning that the assessment of the availability of information, can contribute to the positioning of its users, change of behavior, as well as social, economic and environmental contributions.

By searching for key themes on the computer manufacturers' website (availability), each can receive a maximum score of 10 points and a minimum of zero points. This fact can represent and punctuate the manufacturers that are most in convergence or distant in meeting PNRS and environmental practices.

Considering that the most relevant information can be found on the initial search pages, a maximum of two navigation pages for the results was adopted as navigation. Example: the results obtained are available between pages 1/35, the search was carried out at the most until the second page, from the results provided.

With the data obtained, for GI assessment within the aspects of meeting the PNRS and TIV information availability procedures, one can finally perceive a more accurate assessment, by allocating the surveyed manufacturers in a ranking of the GI commitment classification , according to environmental aspects, represented by APPENDIX B This deal seeks the possibility of pointing out the level of commitment of manufacturers on the perspective of GI. It was also possible to identify the positive / negative points, which can be used for improvement processes within the IM system, emphasizing the practices of PNRS and TIV.

7.4 STEPS AND GUIDING CRITERIA: APPLICATION OF THE PROTOCOL

To facilitate the informational search on the websites of computer manufacturers, and in the application of the protocol in an equal way to all those surveyed, the following are some guiding steps in the application of the protocol in a unique way:

1) On the initial website of the surveyed manufacturers: search for key themes (availability);

2) After the search result, check the application of the four situations:

a. Only a single piece of information was found, and this corresponds to the search content. In this case, the manufacturer receives partial score “1”;

b. Only a single piece of information was found, and it does not correspond to the search content. In this case, the manufacturer receives partial score “0”;

c. Various information was found, but only some of it represents the content sought. In this case, the manufacturer receives a partial score according to the percentage of useful information. Example: the search brought 10 results, but only 3 of them represent the search content, so the partial score represents 0.3 (of the total results presented, only three of them represent the search content).

d. Various information was found, but none of them represent the content sought. In this case, the manufacturer receives a partial score “0”.

At this point, each item assessed has a score, where the most relevant criteria receive higher scores. The weights assigned within the researched criteria are based on the authors' perception, their relevance according to legislation and the importance in the literature.

CHAPTER 8
PRESENTATION OF THE PANORAMA AND RANKING OF RESEARCHED MANUFACTURERS

This chapter presents the results of the evaluation of the websites of the computer manufacturers surveyed. To facilitate understanding and visualization, the layout and presentation of data was initially tabulated in a final score from each manufacturer surveyed, within the weightings of information availability / commitment to the IM in terms of PNRS and TIV, aiming at pointing out users' difficulties, strengths, points for improvement and attention.

8.1 FINAL NOTE: ASSESSMENT OF INFORMATION AVAILABILITY, ADOPTION OF PNRS AND TIV

The final score obtained through the application of the research protocol, the availability of information on the fulfillment of the PNRS and the aspects of TIV, of the computer manufacturers, on their websites, considers the sum of the partial marks in relation to the importance of each criterion. At first, all manufacturers of the sample were evaluated, their partial evaluations and particularities are described in their respective APPENDICES.

This topic aims to verify the availability of information, on websites of computer manufacturers, jointly addresses aspects of mapping information, regarding the question of availability, identification of perceived distortions, related to PNRS and TIV.

The notes presented on the websites of the surveyed manufacturers, through the application of the research protocol, can be followed through Table 02.

Table 02 - Evaluation - note of the websites of the computer manufacturers in relation to the availability of information on aspects of PNRS and TIV services.

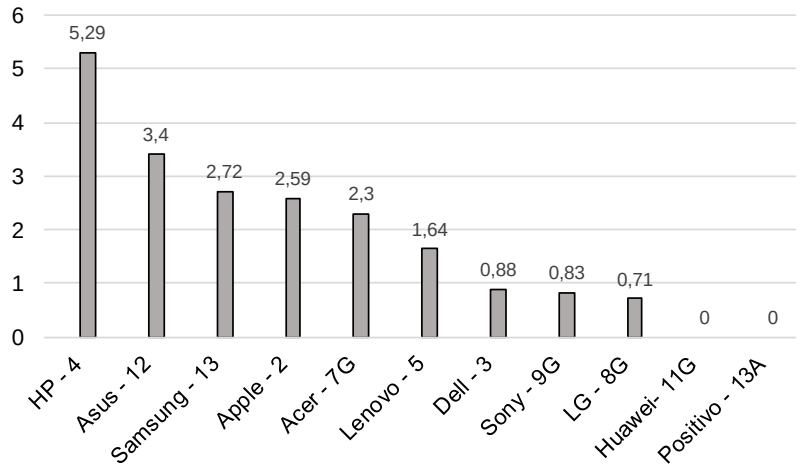
Manufacturer	Electronic Site	Grade
HP	http://www8.hp.com/br/pt/home.html	5,29
Asus	https://www.asus.com/br/Laptops/	3,4
Samsung	http://www.samsung.com/br/pc/all-pc/	2,72
Apple	https://www.apple.com/br/	2,59
Acer	https://www.acer.com/ac/pt/BR/content/home	2,3
Lenovo	https://www3.lenovo.com/br/pt/	1,64
Dell	http://www1.la.dell.com/content/default.aspx?c=br&l=pt&s=&s=gen&~ck=cr	0,88
Sony	http://www.sony.com.br/	0,83
LG	http://www.lg.com/br/computadores	0,71
Huawei	http://consumer.huawei.com/en/tablets/matebook-x/	0
Positivo	https://www.meupositivo.com.br/	0

Source: Leinig (2018).

According to these data, for the calculation of the standard deviation, it was possible to verify the result of 1.6; of the 11 computer manufacturers analyzed, where 5 of the manufacturers were below this value and 6 above the calculated result. The highest perceived evaluation score was achieved by the manufacturer HP (Note: 5.29), on the other hand, the lowest score (ZERO), was registered at the manufacturers: Huawei and Positivo (Grade: zero).

A better visualization of the rankings of the evaluation scores of the computer manufacturers, can be seen through Graph 03.

Graph 03 - Ranking of computer manufacturers' websites - final grade.



Source: Leinig (2018).

No manufacturer reached the maximum score, that is, availability of all the criteria evaluated within the research protocol. Looking further, none of the manufacturers reached a degree of commitment to GI (availability), said to be excellent or excellent.

Only the HP manufacturer achieved a score of 5.29, out of a total of 10, which corresponds to a degree of commitment to GI (availability) to aspects of PNRS and TIV, considered good. In this scenario, it is designed that the manufacturer, despite being the best evaluated, among the others evaluated, should still consider improvement processes and studies, especially regarding the availability of their information.

Contrary to this condition, there are manufacturers who obtained ZERO scores, that is, the degree of REGULAR commitment to the availability of information within the criteria of PNRS and TIV; among them: Huawei and Positivo.

Table 03 shows the manufacturers according to the degree of commitment perceived through their websites, on the criteria proposed by the protocol of this research.

Table 03 - Evaluation of computer manufacturers' websites - degree of commitment to GI (availability - information) aspects of PNRS and TIV.

Classification	Level	Manufacturer
Excellent	High Commitment	-
Great	Commitment	
Good	Commitment requires improvement	HP
Regular	Low commitment	All others

Source: Leinig (2017).

In the next subsections, more detailed results and the discussion about them are presented, particularities found during the study, in each of the manufacturers surveyed, as well as perceived difficulties.

8.2 APPROXIMATION AND ASSOCIATION OF THE PHYSICAL UNIVERSE OF LR AND TIV WITH THE INFORMATIONAL UNIVERSE

In an attempt to approach and associate the physical universe of LR processes and TIV conceptions, only three manufacturers, out of the 11 surveyed manufacturers, provide the information of their e-mail addresses: Acer, Asus, Samsung, (the description contained in the e- mail forwarded, for being verified through APPENDIX

C, and responses obtained APPENDIX D). Even so, it is possible to notice the lack of these manufacturers regarding the LR regulation established by PNRS in 2010, of which the manufacturers are responsible as an agent in the processes of returning their products to the production chain. Another relevant consideration corresponds to the fact that none of the manufacturers assists the user by sending their computers to the user.

Acer: describes that the customer must go to a post office and pay for shipping the equipment. In this case, the manufacturer is already violating one of the principles of the National Solid Waste Policy Law, which in its Art. 6 II, describes that the polluter must be the payer in this correct waste disposal process;

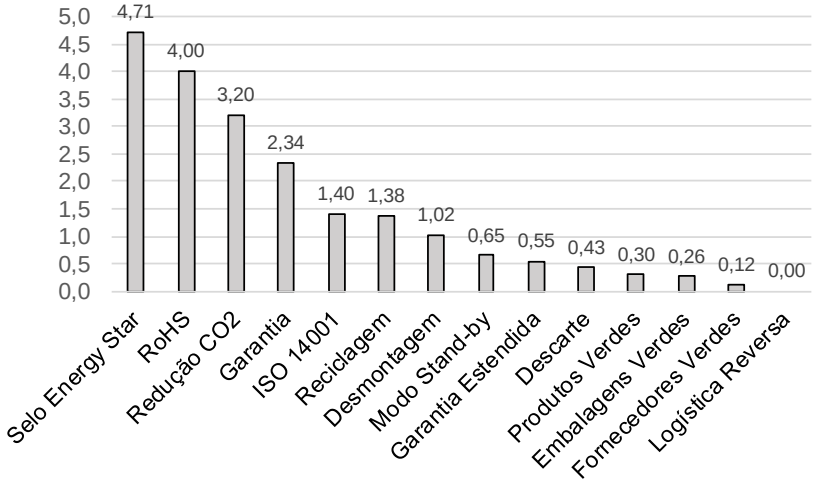
Asus: directs the responsibility of receiving its products, to collection points of the city hall of each city; Samsung: directs the referral to an authorized company, but we do not know the method of disposal used.

This table shows the enormous distance between the practices of computer manufacturers in complying with the PNRS. The law stipulates manufacturers to implement an LR system, procedures and destination; aiming at collecting and refunding the solid waste business sector, envisioning its reuse, in its own cycle or in others, or even its final destination in an environmentally appropriate manner.

8.3 MAPPING AND VERIFICATION OF THE CRITERIA EVALUATED

According to the verification of the evaluated criteria, the most perceived, in the concerns of the criteria searched on the websites of computer manufacturers, are shown in Graph 04.

Graph 04 - Main criteria perceived on the websites of the computer manufacturers surveyed.



Source: Leinig (2017).

Among the most observed criteria, those most considered by the computer manufacturers in the research, are identified as the use of the Energy-Star label, European Directive on the restriction of certain dangerous substances (RoHS) and reduction of the emission of CO2 pollutants.

A point that draws attention, is reflected in the low perceptions of the LR issues (last perceived criterion), emphasizing the proposal of the research protocol, this criterion represents one of the most relevant questions. The LR criterion must mainly take into account the regency and the existence of a national law, PNRS.

8.4 NOTES OF PARTICULARITIES, DIFFICULTIES PERSPECTIVE OF MANUFACTURERS

The annotation in the form of weighting of notes obtained through the application of the search protocol, can assist in the establishment of the directives that are effectively applied and adopted by computer manufacturers. Here, the specificities perceived and the main adopted adoptions are also noted, emphasizing their real practices regarding the fulfillment of PNRS and TIV.

Apple: Note 2.59. In this manufacturer as a result of searching for the criteria, they translate, in its great majority, the offer of the manufacturer's products, from which range from books to USB cables. On the other hand, the main concerns of this computer manufacturer portray the issues of CO2 reduction and processes that facilitate and explain the disassembly of its products.

Dell: Note 0.88. Within the research of this manufacturer it was noticed some errors in the failure to load certain search pages, in addition to several advertising results of its products. Another issue of concern is reflected in the mix of search results, which bring information in English or direct to the manufacturer's main website (in English). For this manufacturer, the greatest concern is reflected in the use of the Energy-Star label and the establishment of partnerships with suppliers engaged with environmental issues.

HP: Note 5.29. It represents the best evaluation within the surveyed manufacturers. Through the search for the criteria proposed by the research protocol, some pages showed errors in their loading, the existence of product advertisements and forwarding to a discussion chat, within which the user could discuss their doubts. This manufacturer has its concerns focused on obtaining ISO 14001 environmental certification, care with the composition and use of certain hazardous substances in its

products (RoHS), the reduction of CO2 emissions and the provision of warranty and extended warranty services.

Lenovo: Note 1.64. The search in this manufacturer resulted in several repair manuals for its products, information in English and errors in page loading. His main concerns relate to the Environmental Management certificate (ISO 14001) and the use of the Energy-Star label, in the background the availability of warranty service for his products.

Acer: Note 2.3. After conducting the search, this manufacturer directs the user to the information provided in discussion forums and a list of doubts. Within the conceptions of concerns of the criteria evaluated, firstly, it represents the concern with the use of certain hazardous substances (RoHS), secondly, disposal and recycling, and thirdly, product warranty service. This manufacturer makes available through its website, its electronic address, from which it made possible a more detailed research of its positioning in relation to LR. Even so, the informed response was the orientation of the client's direction, to a bank branch and the payment of all postage costs.

LG Note 0.71. The search resulted in the presentation of products, guidance to company support and questions from users. Its main concern is the use of the Energy-Star label in its products.

Sony Note 0.83. The search results largely bring advertising for other products. His biggest concern relates to the emission of CO2, and in a second moment, the offer of the guarantee service for his products. This manufacturer, in spite of not making his e-mail address available on his website, regarding the issues of disposal and recycling, advises the user to look for collection points from the city hall of his city.

Huawei Note ZERO. Availability of the information in English and of all the researched criteria, the results addressed consumer questions. It still presents errors in the loading of pages, pages without any information and support. A particularity / difficulty of this manufacturer is that from its home page, when the search was performed and the icon - command return was selected, the searches were lost. The search results in returning to your home site and forcing the user to perform the search again.

Asus Note 3.4. Its main concerns reflect the use of the Energy-Star label, reduction of CO2 emissions, and warranty service for its products. This manufacturer makes available through its website, its electronic address, enabling a more detailed search of its position in relation to LR, the answer provided guides the user who wishes

to dispose of his computer in an environmentally correct way, in the search for collection carried out by the local city halls. This manufacturer is the only one that offers a green computer “Bamboo”, which has a totally ecological design and even emits bamboo scent.

Samsung Note 2.72. Through the search for the evaluated criteria, there is a great focus on manufacturer support, customer questions, product advertising, information from pages in English and even the targeting of an HP page. The main perceptions of the manufacturer represent the concern with the use of certain hazardous substances (RoHS) and warranty service, secondly the Stand-by mode of its products. This manufacturer makes available on its website, its electronic address, within the most detailed survey of its positioning in relation to LR, it guides the customer to seek technical assistance authorized by the manufacturer.

Positivo: Note 0. Despite representing a company associated with ABINEE's Green Eletron and consequently has purposes aimed at complying with Law 12.305 / 2010 - PNRS, it does not provide any of the criteria proposed within the research protocol.

CHAPTER 09
FINAL DEBATE

The age of technology and information demonstrates the need for people to obtain any information, instantly, anywhere, anytime. Faced with a growing consumer market, considering the high rate of induced obsolescence of computers, the desire to consume new technologies and concerns about the proper disposal of this equipment must be assessed as a primary factor. However, information on correct disposal behavior must be available to the consumer, aiming at minimizing the harmful environmental impacts that an incorrect disposal of this type of waste can offer.

In order to provide a better identification of the availability of information, on the websites of computer manufacturers, in the perspective of the PNRS and TIV, the points raised establish a scenario from which one can still perceive a great distance from the availability of information on environmental practices. to the user. Although the existence of standards and laws, the increase in consumer perception, awareness and demands, increasing market pressures, competitiveness, these are still not enough for computer manufacturers to show themselves effectively engaged in environmental practices.

Emphasizing the PNRS, Law No. 12,305 / 2010 in its art. 33, which obliges manufacturers, importers, distributors and traders of various products, including electronic equipment, to structure and implement a reverse logistics system, with the return of the products after their use / consumption, independently of the public service of urban cleaning and solid waste management (BRASIL, 2010). It is noticed, then, the lack of consonance of the computer manufacturers with the legal requirements of the PNRS Law, being extremely necessary the development of actions that aim to facilitate the establishment of these legal requirements.

Guided the research problem of the study, which represents the way in which the GI (information availability) positively assists with the PNRS and TIV processes, considering aspects of acquisition, use and disposal of computers, on the computer websites, although several points must be reassessed and restructured, with the objective of bringing users all the benefits arising and perceived from an IG in accordance with the availability of search information.

The minimization of environmental problems resulting from the incorrect disposal of waste electronic equipment cannot be linked only to legal issues, it transcends other factors, such as the exercise of social and environmental responsibility by manufacturers and changes in the values of society itself, especially with performance of preventive and participatory behavior. In this scenario, access to information is shown to be a primary factor in helping the individual's posture and conduct.

These results demonstrate that there is a need for great progress, several improvement processes and, above all, real and assertive commitment by computer manufacturers to society and the environment. Results of this study demonstrate that the surveyed manufacturers are far behind in the availability of information within the perspective of PNRS and TIV.

It is hoped that the results presented and the considerations that have elapsed can somehow assist computer manufacturers in the elaboration of their conducts for the adoption and fulfillment of their actions in accordance with the law. These aspects are linked mainly to the availability of information to its consumers, from the acquisition of computers, consumption processes to finally its disposal in an environmentally correct manner.

REFERENCES

ABDI – Agência Brasileira de Desenvolvimento Industrial **Logística Reversa de Equipamentos Eletroeletrônicos. Análise da Viabilidade Técnica e Econômica**. 2013. Brasília DF/ Brasil.

ABINEE – Associação Brasileira da Indústria Elétrica e Eletrônica. **A indústria elétrica e eletrônica impulsionando a economia verde e sustentabilidade** (2017). Available in: http://www.abinee.org.br/informac/arquivos/fasci17.pdf. Accessed in March 14th, 2018.

ADAMS, P. A Study on Key Issues in Green Marketing Viz a Viz Green Products. London United Kingdom. Scholedge International **Journal Of Management & Development** V.1, 2014. p. 5-11.

AGRAWAL, A. D.; DAS, M. Green Marketing: Sustainable Marketing Strategy**. Indira Management Review**, v. 10, n. 4, p. 17-31, 2013.

ALVARÃES, A.C.T. **Sistemas, Organização e Métodos** – **Visão sistêmica e metodologia prática para a organização empresarial**. Rio de Janeiro. Available in <http://www.craj.adm.br/publicacoes/acervo_digital/alberto_alvaraes/publicacao/files/livro.pdf > Accessed in October 24th, 2017.

ANDRADE, V. B. **Estética da Mercadoria e Obsolescência**: um estudo da indução ao consumo no capitalismo atual. 2007. Dissertação (Mestrado em Sociologia) - Universidade Estadual Paulista, Araraquara, Brasil.

BOSSUET, L. Sustainable Computing: Informatics and Systems. Elsevier. **Sustainable Computing: Informatics and Systems**, v. 4, p. 196-202, 2014.

BOWERSOX, D.J.; CLOSS, D.J. **Logística empresarial: o processo de integração da cadeia de suprimento**. São Paulo: Atlas, 2001.

BRASIL. **Lei 12.305 de 02 de agosto de 2010**. Institui a Política Nacional de Resíduos Sólidos; altera a Lei n. 9.605, de 12 de fevereiro de 1998; 2010. Available in < http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Lei/L12305.htm>: Accessed in: October 29th, 2017.

CETIC – **Centro Regional de Estudos para o Desenvolvimento da Sociedade da Informação**. Available in:<http://data.cetic.br/cetic/explore?idPesquisa=TIC_DOM>. Accessed in March 28th, 2018.

CIOCOIU, N. BURCEA, S. TÂRTIU, V. The WEEE Management System in Romania. Dimension, Strengths and Weaknesses. **Theoretical and Empirical Researches in Urban Management**, v. 6, n. 15, p 05-22, 2010.

CHAFFEY, D. WOOD, S. **Business Information Management**. Improving Performance Using Information Systems, Prentice Hall. Financial times. 2005.

CHUNG, S-S. LAU, K-Y. ZHANG, C. Generation of and control measures for, e-waste in Hong Kong. Elsevier. **Waste Managent**, v. 60, p. 544-554, 2011.

COLESCA, S. E. CIOCOIU, C. N. POPESCU, M. L. Determinants of WEEE Recycling Behavior in Romania: A Fuzzy Approach. **Int. J. Envion Res.** Spring. v. 8, n. 2, p. 353-399, 2014.

DAVENPORT, T. H. **Ecologia da Informação**. — São Paulo: Futura, 1998.

DAO, V. LANGELLA, I. CARBO, J. From green to sustainability: Information Technology and an integrated sustainability framework. Elsevier. **Journal of Strategic Information Systems** n. 20, p. 63-79, 2011.

DEMAJOROVIC, J. MIGLIANO, J. E. B. - Política Nacional de Resíduos Sólidos e suas Implicações da Cadeia da Logística Reversa de Microcomputadores no Brasil. **Gestão & Responsabilidade**. v, 29, n 87, p. 64-80, 2013.

EC – European Commission - **Development of Guidance on Extended Producer Responsibility** (EPR). 2014.

EPA - **United States Environmental Protection Agency**. Available in <http://www3.epa.gov/>. Accessed in February 20th, 2018.

EPEAT - **Electronic Product Environmental Assessment Tool**. Available in http://www.epeat.net/. Accessed in February 20th, 2018.

E-WASTE GUIDE – **Hazardous Substances in e-Waste**. Available in http://ewasteguide.info/hazardous-substances. Accessed in October 6th, 2015.

FELIX, W. **Introdução à Gestão da Informação**. Administração & Sociedade. Alínea Editora. Campinas SP. 2003.

FERREIRA, Fernando Nicolau Freitas. **Segurança da Informação**. Rio de Janeiro: Ciência Moderna, 2003.

FGV – **Fundação Getúlio Vargas**. Available in: http://ftp.ibge.gov.br/Estimativas_de_Populacao/Estimativas_2014/nota_metodologica_2014.pdf. 2014. Accessed in Accessed in September 24th, 2015.

FU, X. ZHU, Q. SARKIS, J. Evaluating green supplier development programs at telecommunications systems provider. **Int. J. Production Economics**. p. 357-367, 2012.

GERBASE, A. E. OLIVEIRA, C. R. Reciclagem do Lixo de Informática: Uma Oportunidade para a Química. **Quim. Nova**, v. 35, n. 7, p.1486-1492, 2012.

GHOLAMI, R. SULAIMAN, A. B. RANAYAH, T. MOLLA, A. Senior managers' perception on green information systems (IS) adoption and envioranmetal performance: Results from a field survey. Elsevier, **Information Management** p 431-438, 2013.

GIARETTA, J. B. Z. TANIGUSHI, D. G. SERGENT, M. T. VASCONCELLOS, M. P. GÜNTTER, W. M. R. Hábitos Relacionados ao Descarte Pós-Consumo de Aparelhos e Baterias de Telefones Celulares em uma Comunidade Acadêmica. **Saúde Soc**. São Paulo, p. 674-684, 2010.

GÓMEZ, M. N. G. Novas fronteiras tecnológicas das ações da informação: questões e abordagens. **Ci Inf**. Brasília. v.33. p.55-67, 2004.

GREENPEACE – **Guide to Greener Eletronics**. Washington D.C. 2017.
IBGE Instituto Brasileiro de Geografia e Estatística. População – **Projeção da população do Brasil e das Unidades da Federação**. Available in < https://www.ibge.gov.br/apps/populacao/projecao/>. Accessed in May 8th, 2018.

IBGE **Instituto Brasileiro de Geografia e Estatística** <http://www.brasil.gov.br/infraestrutura/2014/09/ibge-metade-dos-brasileiros-teve-acesso-a-internet-em-2013 acesso 31/08/2015>2014. Accessed in August 31st, 2015.

IDC – Analyze the Future. **Mercado brasileiro de PCs cresce 5% em vendas no segundo trimestre, revela estudo da IDC Brasil**. Available in: < http://br.idclatin.com/releases/news.aspx?id=2211>. Accessed in October 26th, 2017.

JABBOUR, A. B. L. S. – Understanding the genesis of green supply chain management lessons from leading Brazilian companies. Elsevier. **Journal of Cleaner Production.** v. 87, p. 385-390, 2015.

JAISWAL, A. SAMUEL, C. PATEL, B. S. KUMAR, M. - Go Green with WEEE: Eco-friendly approach for handling e- waste. Elsevier. **Procedia Computer Science**. v. 46, p. 1317-1324, 2015.

JENKIN, T. A. WEBSTER, J. McSHANE, L. An agenda for 'Green' information technology and systems research. Elsevier**, Information and Organization.** v. 21, p 17-40, 2011.

KANCHANAPIBUL, M. LACKA, E. WANG, X. CHAN, H K. An empirical investigation of green purchase behavior among the young generation. Elsevier. **Journal of Cleaner Production**. v. 66, p. 528-536, 2014.

KHOR K. S. UDIN Z. M. Reverse logistics in Malaysia: Investigating the effect of green product design and resource commitment. Elsevier. **Resources Conservation and Recycling**, v. 81, p 71-80, 2013.

LEITE, P. R. **Logística Reversa**: Meio Ambiente e Competitividade. 2. ed. São Paulo, Pearson Prentice Hall, 2003.

LJUNGBERG, L. Y. Materials selection and design for development of sustainable products. Elsevier. **Material & Design**. v. 28, p. 466-479, 2007.

LOPES, I. L. Novos Paradigmas para a Avaliação da Qualidade da Informação em Saúde Recuperada na Web. **Ci. Inf**. Brasília. v.33. p.81-90. 2004.

LOPES, V. N. PACAGNAN M. N. Marketing verde e práticas socioambientais nas indústrias do Paraná. **R. Adm.,São Paulo**, v.49, n.1, p.116-128, 2014.

LUNARDI, G. L. SIMÕES, R. FRIO, R. S. TI Verde – Uma análise dos principais benefícios e práticas utilizadas pelas organizações**. READ** – Porto Alegre. Ed. 77. n. 1, p.1-30, 2014.

LUNARDI, G. L. ALVES, A. P. F. SALLES, A. C. Desenvolvimento de uma escala para avaliar o grau de utilização da tecnologia da informação verde pelas organizações. **R.Adm**., São Paulo, v.49, n.3, p.591-605, 2014.

MATTOS, K. M. MATTOS, K. M. C. PERALES, W. J. S. Os impactos ambientais causados pelos resíduos eletrônicos e o uso da logística reversa para minimizar os efeitos causados ao meio ambiente**. In: ENCONTRO NACIONAL DE ENGENHARIA DE PRODUÇÃO**, Rio de Janeiro. RJ. Brasil. p.1-11, 2008.
MCGEE, J. V.; PRUSAK, L. **Gerenciamento estratégico da informação**: aumente a competitividade e a eficiência de sua empresa utilizando a informação como uma ferramenta estratégica. 12. ed. Rio de Janeiro: Campus, 2003.

MINISTÉRIO DE MINAS E ENERGIA – MME – **Plano Nacional de Eficiência Energética**. Available in <http://www.mme.gov.br/documents/10584/1432134/Plano+Nacional+Efici%C3%AAncia+Energ%C3%A9tica+%28PDF%29/74cc9843-cda5-4427-b623-b8d094ebf863>. Accessed in October 11th, 2018.

MINISTÉRIO DO MEIO AMBIENTE – MMA – **Brasil reduzirá 43% das emissões até 2030**. Available in < http://www.mma.gov.br/index.php/comunicacao/agencia-informma?view=blog&id=1163> Accessed in April 11th, 2018.

MISHRA, D. AKMAN, I. MAISHRA, A. Theory of Reasoned Action application for Green Information Technology acceptance. Elsevier. **Computers in Human Behavior**. v. 36, p. 29-40, 2014.

MOLLA, A. GITAM: A Model for the Adoption of Green IT. Association for Information Systems. **AIS Eletronic Library (AISeL).** 19th Australasian Conference on Information Systems, p. 656-668, 2008.

NBR ISO 14001 – **Sistemas da gestão ambiental: requisitos com orientação para uso**. Rio de Janeiro: ABNT, 2004

NI-IAS, United Nations University – **Institute for the Advanced Study of Sustainability**. eWaste in Latin America, (2015). Available in: < https://www.gsma.com/latinamerica/wp-content/uploads/2015/11/gsma-unu-ewaste2015-eng.pdf>. Accessed in March 7th, 2018.

NOEL, F. L. Revista Brasileira de Saneamento e Meio Ambiente. **BIO**, v.1 p. 20-29, 2014.

NOVAES, M. P. ZANTA, V. M. **O reuso dos computadores pós-consumo: desafios e oportunidades.** XXXXI Encontro Nacional de Engenharia de Produção. 2011. Belo Horizonte. MG – Brasil.

NUNES, A.C.P. CHAGA, A. C. CAMILO, A. SANTOS, N. M. **A TI Verde na Sociedade Atual**. Instituto Federal de Educação Ciências e tecnologia do Piauí (IFPI), p.01-09, 2011.

ONGONDO, F. O. WILLIAMS, CHERRETT, T. J. How are WEEE doing? A global review of management of electrical and eletronic waste –Elsevier **Waste Management.** v. 31, p. 714-730, 2011.

ORNA, E. Pratical Information polices. **How to manage information flow in organizations**. Gower. USA. 1990.

PAVANELI, A. B. **Divulgação de informações sobre contratos firmados para a aquisição de bens execução de obras e serviços públicos: um protocolo para avaliação de portais estaduais**. Dissertação (Mestrado Ciência, Gestão e Tecnologia da Informação) UFPR. Curitiba. Paraná. 2015.

PEGIRSU – **Plano Estadual para a Gestão Integrada e Associada de Resíduos Sólidos Urbanos do Paraná – Paraná sem lixões**. Governo do Paraná. 2013.

PERRONE, Renato Gomes. **Sistema de Planejamento Corporativo: enfoque sistêmico**. Rio de Janeiro: Qualitymark, 2006.
PIRES, S. R. I. **Gestão da Cadeia de Suprimentos (Supply Chain Management), conceitos e estratégias, práticas e casos**. São Paulo. Atlas. 2004.

PREFEITURA MINICIPAL DE CURITIBA (PMC) – **Secretaria do Meio Ambiente**. Available in <http://www.curitiba.pr.gov.br/noticias/prefeitura-lanca-campanha-para-incentivar-reducao-de-lixo/32522>. 2015. Accessed in October 6th, 2015.

PREFEITURA MINICIPAL DE CURITIBA (PMC) - **Secretaria Municipal de Finanças e** Departamento de Rendas Imobiliárias. Prefeitura Municipal de Curitiba (PMC), 2014.

PUJARI, D. WRIGHT, G. PEATTIE, K. Green and competitive Influences on environmental new product development performance. Elsevier. **Journal of Business Research**. v. 56, p. 657 – 671, 2003.

RAVI, V.; SHANKAR, R.; TIWARI, R. M. Analyzing alternatives in reverse logistics for end-of-life computers: ANP and balanced scorecard approach. **Computers & Industrial Engineering**, v. 48, p.327-356, 2005.

ROBINSON, B. H. E-waste, An assessment of global prodution and environmental impacts. **Science of the Total Environment**, v. 408, p. 183-191, 2009.

ROCHA G. H. T. GOMES, F. V. B. – **Diagnóstico da Geração de Resíduos Eletroeletrônicos no Estado de Minas Gerais.** Fundação Estadual do Meio Ambiente (FEAM) 2009.

RoHS – ***Restriction of Certain Hazardous Substances***. Available in http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0095. Accessed in March 12th, 2017.

ROSENFELD, L; MORVILLE, P. **Information Architecture for the World Wide Web**, 3ª Edição, Sebastopol, CA. O´Reilly, 2006.

SECRETARIA MUNICIPAL DE FINANÇAS - SMF/FRM **Secretaria Municipal de Finanças e Departamento de Rendas Imobiliárias**. Prefeitura Municipal de Curitiba (PMC), 2014.

SANTOS, L. R. N. **Gestão da Informação Científica Aberta: Um Estudo Aplicado a Vídeo Científico em Eventos**. Dissertação (Mestrado Ciência, Gestão e Tecnologia da Informação) UFPR. Curitiba. Paraná. 2017.

SARKIS, J. A strategic decision framework for green supply chain management. **Journal of Cleaner Production**. v.11, p. 397-409, 2003.

SHARMA, M., AMMONS, J.C. e HARTMAN, J.C. Asset management with reverse product flows and environmental considerations. **Computers & Operations Research**, v. 34. p.464-486, 2007.

SMF/FRM **Secretaria Municipal de Finanças e Departamento de Rendas Imobiliárias**. Prefeitura Municipal de Curitiba (PMC), 2014.

TAN, A.; YU, W.; ARUM, K. Improving the performance of a computer company in supporting its reverse logistics in the Asia-Pacific region. **International Journal of Physical Distribution and Logistics Management**. v.33, n. 1, p. 59-74, 2003.

TAYLOR, A. **Postmodernist and consumerist influences on information consumption**. Kybernetes.2014.

TOMASIN, L. PEREIRA, G. M. BORCHARDT, M. SELLITTO, M. A. How can the sales of green products in the Brazilian supply chain be increased? Elsevier. **Journal of Cleaner Production**. v. 47, p. 274-282, 2013.

TSENG, S-C HUNG, S-W. A framework identifying the gaps between customers' expectations and their perceptions in green products. Elsevier. **Journal of Cleaner Production**. v. 59, p. 174-184, 2013.

VEGA, O. A. The Technological obsolescence´s collateral effects. **Revista Facultad de Ingenieria.** IPIC. v.21, n. 32, p.55-62, 2012.

YANG, Y. WILLIAMS, E. - Logistic model-based forecast of sales and generation of obsolete computers in the U.S. **Technological Forecasting & Social Chang.** Elsevier. v.76, p. 1105-1114, 2009.

WANG, Y. CHEN, Y. AMADO, J. B. How information technology influences environmental performance: Empirical evidence from China. Elsevier, **International Journal of Information Management**. v. 241, p. 160-170, 2015.

WEEE - **Waste of Electrical and Electronic Equipment** – Available in http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0096. Accessed in March 12th, 2018.

WIKEPÉDIA. **List of computer system manufacturers.** Available in https://en.m.wikipedia.org/wiki/List_of_computer_system_manufacturers. Accessed in December 4th, 2017.

ZIKMUND, Willian G.; STATON, Willian J. Recycling solid wastes: a channel of distribuition problem. **Journal of Marketing**, jul. 1971.

ANNEX A – NATIONAL POLICY ON SOLID WASTE - 2010. PRINCIPLES

ARTICLE 6

I - The polluter pays and the protector receives;

III – Within solid waste management it establishes the systemic view, considering environmental, social, cultural, economic, technological and public health factors;

IV – The sustainable development;

V - Eco efficiency, through the compatibility between the supply, at competitive prices, of goods and services qualified according to human needs with the possibility of quality of life and the minimization of environmental impacts and the consumption of natural resources at a level, in the minimum equivalent to the planet's estimated carrying capacity;

VI - Cooperation between the different spheres of public power, the business sector and other segments of society;

VII - The shared responsibility for the products' life cycle;

VIII - The recognition of reusable and recyclable solid waste as an economic good and of social value, generating work and income and promoting citizenship;

IX - Respect for local and regional diversity;

X - Society's right to information and social control;

XI – Reasonableness and proportionality.

ANNEX B – COMPOSITION OF MATERIALS FOUND IN REEES AND HUMAN HEALTH RISKS

Materials	Causes
Arsenic	Skin diseases, lung cancer.
Barium	Muscle weakness, damage to the heart, liver, spleen, increased blood pressure.
Beryllium	Lungs, skin diseases, healing difficulties
Brominated flame retardants (BFRs)	Hormonal disorders.
Cadmium	Kidneys, weakness, fever, headache, chills, sweating, muscle pain, lung cancer, kidney damage, pulmonary emphysema, bone disease.
Chrome	Irritation of eyes, skin and mucous membranes.
Dioxins and furans	They can affect the development of fetuses, decrease the rate of growth and reproduction, damage to the immune system.
Lead (fifth most used metal)	Diarrhea, seizures, fatigue, insomnia, irritability, abdominal pain, headache, kidney damage.
Mercury (one of the most dangerous metals)	Harmful to the brain and liver.

Source: e-Waste Guide (2015).

APPENDIX A - RESEARCH PROTOCOL - ELECTRONIC SITES OF COMPUTER MANUFACTURERS

RESEARCH PROTOCOL - ELECTRONIC SITES OF COMPUTER MANUFACTURERS, IN RELATION TO AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer:			**Research:**			
Electronic Site:						
Available information:			**Evaluation:**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner?	"Reverse logistic"		1,00	
			Discard		1,00	
2	Energy Efficiency	Concern about making energy-efficient computers? Products with the selection of reduced energy consumption?	“Energy Star” Label		0,70	
			Mode "*Standby"*		0,70	
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"		0,70	
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS		1,00	
5	CO_2 reduction	Practices and strategies aimed at minimizing the emission of polluting gases?	CO_2		0,70	
6	Green Products	Environmentally friendly equipment available?	"Green Product"		0,50	
7	Green Suppliers	Concerns about negotiations with green suppliers?	"Green Supplier"		0,50	
8	Green Packaging	Concerns in the manufacturing process with green packaging?	Green “Packaging”		0,50	
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly		0,50	
			Recycling		0,50	

10	Warranty	Does the product offer warranty service?	Warranty		0,50	
			“Extended” Warranty		0,30	
Total partial					10,00	
TOTAL						

APPENDIX B – LEVEL OF COMMITMENT OF THE MANUFACTURERS 'GI TO THE ASPECTS OF LR AND TIV.

Classification	Level	Punctuation	Result
Excellent	High Commitment	10-9,0	
Great	Commitment	8,9-7,0	
Good	Commitment requires improvement	6,9-5,0	
Regular	Low commitment	4,9-0	

APPENDIX C – DESCRIPTION OF THE EMAIL FORWARDED TO COMPUTER MANUFACTURERS TO CHECK THE TREATMENT OF LR.

“Dear Sirs: My computer is not working anymore. What is the best procedure for disposal? Thankful"

APPENDIX D - RESPONSES OBTAINED FROM MANUFACTURERS RESEARCHED - DISPOSAL POSSIBILITY.

No.	Manufactures	Electronic Site	Answers
7	Acer	https://www.acer.com/ac/pt/BR/content/home	The customer must go to a post office and pay for shipping the equipment
12	Asus	https://www.asus.com/br/Laptops/	The customer should look for the electronic waste disposal service in his municipality, usually present on the website of his municipality.
13	Samsung	http://www.samsung.com/br/pc/all-pc/	We advise you to check the possibility with one of our Authorized.

APPENDIX E – MANUFACTURER: APPLE

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Apple		**Research: November 2017**				
Electronic Site: https://www.apple.com/br/						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers? Products with the selection of reduced energy consumption?	“Energy Star” Label	0,60	0,70	0,42
			"Stand by" Mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies aimed at minimizing the emission of polluting gases?	CO_2	1,00	0,80	0,80
6	Green Products	Environmentally friendly equipment available?	"Green Product"	0,00	0,60	0,00
7	Green Suppliers	Concerns about negotiations with green suppliers?	"Green Supplier"	0,20	0,60	0,12
8	Green Packaging	Concerns in the manufacturing process with green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	1,00	0,60	0,60
			Recycling	0,94	0,60	0,56
10	Warranty	Does the product offer warranty service?	Warranty	0,07	0,60	0,04
			“Extended” warranty	0,10	0,50	0,05
Total partial					10	2,59
TOTAL						**2,59**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Apple

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grades
1	Reverse logistic	7	0	0,00	0,00	1 - Usb, 5 - product advertising, 1 - third quarter result, dealing only with logistics.
	Discard	4	0	0,00	0,00	1 - report in English, 1 - user question, 1 - books, 1 - discarding books, 1 - musical band
2	“Energy Star” Label	25	15	60,00	0,60,00	1 - report, 2 - drag feature, 1 - screen design, 1 - illustration (Apple Pencil), 2 - film, 1 - thermostat, 1 - English, 1 - stores
	Stand-by mode	19	0	0,00	0,00	1 - product design, 1- albums, 2 - Apple Pencil, 1 - apps, 5 - product, 1 - music, 6 - English, 1- photography, 1 - point of sale
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	1	0	0,00	0,00	1 - user question
5	CO_2 reduction	1	1	100,00	0,00	
6	Green Products	30	0	0,00	0,00	2 - service / support, 4 - product color, 1 - gift packaging, 5 - environmental report, 1 - customer service, 3 - education, 2 - privacy, 1 - site map, 1 - music, 5 - accessibility, 1 - erase data, 4 - product
7	Green Suppliers	30	6	20,00	0,20	15 - product, 1 - order, 1 - job opportunity, 1 - gift packaging, 1 - protection plan, 1 - site map, 1 - shipping and delivery, 2 - data privacy, 1 - IT
8	Green Packaging	21	0	0	0	15 -product, 5 - resources, 1 -operation plans,
9	Disassembly	1	1	100,00	1,00	
	Recycling	31	29	93,55	0,94	2 - TV
10	Warranty	30	2	6,67	0,07	1 - recycle, 1 - TV, 1 - follow-up report, 1- supplier responsibility, 16- quality / service, 1- safe materials report, 1 - clock, 1 - iCloud, 2 - camera, - 1 - Apple Pencil, 2 - product,
	Extended warranty	30	3	10,00	0,10	1 - recycling, 1 - TV, 3 - environment report, 1 - supplier report, 1 - Policy, 1 - Cloud, 1 - clock, 2 - camera, 10 - product, 1 payment, 4 - service,

APPENDIX F – MANUFACTURER: DELL

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Dell		**Research: November 2017**				
Electronic Site: http://www1.la.dell.com/content/default.aspx?c=br&l=pt&s=&s=gen&~ck=cr						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	0,13	0,70	0,09
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green Products	Environmentally friendly equipment available?	"Green Product"	0,00	0,60	,000
7	Green Suppliers	Concerns about negotiations with green suppliers?	"Green Supplier"	,000	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process with green packaging?	Green Packaging	0,44	0,60	0,26
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,63	0,60	0,38
10	Warranty	Does the product offer warranty service?	Warranty	0,25	0,60	0,15
			“Extended” warranty	0,00	0,50	0,00
Total partial					10	0,88
TOTAL						**0,88**

Classification	level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Dell

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grades
1	Reverse logistic	8	0	0,00	0,00	1 page could not be loaded, 7 - English
	Discard	1	0	0,00	0,00	1 -product
2	“Energy Star” Label	8	1	12,5	0,13	3 - English, 4 - product
	Stand-by mode	16	0	0,00	0,00	8 - product, 8 - English
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	16	0	0,00	0,00	8 - product, 3 - Chinese, 5 - English
5	CO_2 reduction	8	0	0,00	0,00	6 - English, 2 - user manual
6	Green Products	8	0	0,00	0,00	8 – product
7	Green Suppliers	8	0	0,00	0,00	8 - product
8	Green Packaging	16	7	43,75	0,44	9 - product
9	Disassembly	9	0	0,00	0,00	1 - product, 1 - link not found, 1 - English, 6 - procedures
	Recycling	8	5	62,50	0,63	1 - service, 1- English, 1 - product
10	Warranty	8	2	25,00	0,25	6 - product
	Extended Warranty	8	0	0,00	0,00	

APPENDIX G – MANUFACTURER: HP

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: HP			**Research: November 2017**			
Electronic site: http://www8.hp.com/br/pt/home.html						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,1	1,00	0,10
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	0,70
		Products with the selection of reduced energy consumption?	Stand-by mode	0,30	0,70	0,21
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	1,00	0,70	0,70
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	1,00	1,00	1,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	1,00	0,80	0,80
6	Green products	Environmentally friendly equipment available?	Green Product	0,00	0,6	0,00
7	Green Suppliers	Concerns about negotiations with green suppliers?	Green Supplier	0,00	0,60	,000
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,70	0,60	0,42
			Recycling	0,40	0,60	0,24
10	Warranty	Does the product offer warranty service?	Warranty	1,00	0,60	0,60
			Extended Warranty	1,00	0,50	0,50
Total Partial					10	5,29
TOTAL				**5,29**		

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	HP
Regular	Low commitment	4,9 - 0	

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grades
1	Reverse logistic	0	0	0,00	0,00	
	Discard	10	1	10,00	0,10	2 - chat, 1 - service, 6 - products
2	“Energy Star” Label	10	10	100,00	1,00	
	Stand-by mode	3	1	33,33	0,33	1 - navigation guidance, 1 - solution
3	ISO 14001	5	5	100,00	1,00	
4	RoHS	10	10	100,00	1,00	
5	CO_2 reduction	5	5	100,00	1,00	
6	Green Products	0	0	0,00	0,00	
7	Green Suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	10	7	70,00	0,70	3 - memory card
	Recycling	10	5	50,00	0,50	1 - error, 4 - cartridge, 1 - English
10	Warranty	10	10	100,00	1,00	
	Extended warranty	10	10	100,00	1,00	

APPENDIX H – MANUFACTURER: LENOVO

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Lenovo			**Research: November 2017**			
Electronic site: https://www3.lenovo.com/br/pt/						
Available information				**Evaluation**		
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner?	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	0,70
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	1,00	0,70	0,70
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	Green Product	0,00	0,60	0,00
7	Green Suppliers	Concerns about negotiations with green suppliers?	Green Supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	0,40	0,60	0,20
			Extended Warranty	0,00	0,50	0,00
Total Partial					10	1,64
TOTAL						**1,64**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Lenovo

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	
	Discard	0	0	0,00	0,00	
2	“Energy Star” Label	10	10	100,00	1,00	
	Stand-by mode	5	0	0,00	0,00	5 - doubts
3	ISO 14001	1	1	100,00	1,00	
4	RoHS	10	0	0,00	0,00	9 - English, 1 - poster impossible to read
5	CO_2 reduction	1	0	0,00	0,00	1 - data from studies
6	Green Products	1	0	0,00	0,00	1 - English
7	Green Suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	10	0	0,00	0,00	10 - service and repair manual
	Recycling	10	0	0,00	0,00	10 - service and repair manual
10	Warranty	10	4	40,00	0,40	10 - service and repair manual
	Extended warranty	0	0	0,00	0,00	

APPENDIX I – MANUFACTURER: ACER

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Acer			**Research: November 2017**			
Electronic site: https://www.acer.com/ac/pt/BR/content/home						
Available information				**Evaluation**		
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner?	Reverse logistic	0,00	1,00	0,00
			Discard	0,33	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	0,70
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	1,00	1,00	1,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	Green product	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,33	0,60	0,20
10	Warranty	Does the product offer warranty service?	Warranty	0,11	0,60	0,07
			"Extended" warranty	0,00	0,50	0,00
Total **Partial**					10	2,3
TOTAL						**2,3**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Acer

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	
	Discard	3	1	33,33	0,33	2 - customer questions
2	“Energy Star” Label	9	9	100,00	1,00	
	Stand-by mode	4	0	0,00	0,00	4 - forum
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	1	1	100,00	1,00	
5	CO_2 reduction	0	0	0,00	0,00	
6	Green products	0	0	0,00	0,00	
7	Green suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	1	0	0,00	0,00	1 - forum
	Recycling	3	1	33,33	0,33	2 - customer questions
10	Warranty	9	1	11,11	0,11	8 - customer questions
	"Extended" warranty	7	0	0,00	0,00	7 - forum

APPENDIX J – MANUFACTURER: LG

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: LG			**Research: November 2017**			
Electronic site: http://www.lg.com/br/computadores						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse Logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse Logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	0,70
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	Green product	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	0,02	0,60	0,01
			"Extended" warranty	0,00	0,50	0,00
Total Partial					10	0,71
TOTAL						**0,71**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	LG

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse Logistic	0	0	0,00	0,00	
	Discard	1	0	0,00	0,00	1 - doubt
2	“Energy Star” Label	10	10	100,00	1,00	
	Stand-by mode	5	0	0,00	0,00	5 - support
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	0	0	0,00	0,00	
5	CO_2 reduction	0	0	0,00	0,00	
6	Green products	0	0	0,00	0,00	
7	Green suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	0	0	0,00	0,00	
	Recycling	0	0	0,00	0,00	
10	Warranty	54	1	1,85	0,02	53 - refrigerators
	"Extended" warranty	0	0	0,00	0,00	

APPENDIX K – MANUFACTURER: SONY

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Sony			**Research: November 2017**			
Electronic site: http://www.sony.com.br/						
Available information				**Evaluation**		
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse Logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	0,00	0,70	0,00
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	1,00	0,80	0,80
6	Green products	Environmentally friendly equipment available?	Green product	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	0,05	0,60	0,03
			"Extended" warranty	0,00	0,50	0,00
Total **Partial**					10	0,83
TOTAL						**0,83**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Sony

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	
	Discard	20	0	0,00	0,00	17 - products, 3 - requests to look for the nearest city hall
2	“Energy Star” Label	0	0	0,00	0,00	
	Stand-by mode	0	0	0,00	0,00	
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	0	0	0,00	0,00	
5	CO_2 reduction	1	1	100,00	1,00	
6	Green products	0	0	0,00	0,00	
7	Green suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	1	0	0,00	0,00	1 - recyclable plastic
	Recycling	8	0	0,00	0,00	8 - requests to look for the nearest city hall
10	Warranty	20	1	5,00	0,05	18 - products
	"Extended" warranty	0	0	0,00	0,00	

APPENDIX L – MANUFACTURER: HUAWEI

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Huawei			**Research: November 2017**			
Electronic site: http://consumer.huawei.com/en/tablets/matebook-x/						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse Logistic	0,00	1,00	0,00
			Disposal	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	0,00	0,70	0,00
		Products with the selection of reduced energy consumption?	Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	"Green Product"	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	"Green Supplier"	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	"Green Packaging"	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	0,00	0,60	0,00
			Extended Warranty	0,00	0,50	0,00
Total **Partial**					10	0,00
TOTAL						**0,00**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Huawei

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse Logistic	4	0	0,00	0,00	4 - customer doubt
	Disposal	0	0	0,00	0,00	
2	“Energy Star” Label	4	0	0,00	0,00	4- off button,
	Stand-by mode	4	0	0,00	0,00	4 - consumer questions
3	ISO "14001"	0	0	0,00	0,00	
4	RoHS	1	0	0,00	0,00	
5	CO_2	4	0	0,00	0,00	1 - CO-Operation, 3-release information
6	"Green Product"	4	0	0,00	0,00	4 - consumer questions
7	"Green Supplier"	4	0	0,00	0,00	4 - consumer questions
8	"Green Packaging"	4	0	0,00	0,00	3 - consumer questions, 1 - page without information
9	Disassembly	0	0	0,00	0,00	
	Recycling	4	0	0,00	0,00	4- support
10	Warranty	0	0	0,00	0,00	
	Extended Warranty	1	0	0,00	0,00	1 - consumer question

APPENDIX M – MANUFACTURER: ASUS

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Asus			**Research: November 2017**			
Electronic site: https://www.asus.com/br/Laptops/						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers? Products with the selection of reduced energy consumption?	“Energy Star” Label	1,00	0,70	0,70
			Stand-by mode	0,00	0,70	0,00
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	1,00	1,00	1,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	1,00	0,80	0,80
6	Green products	Environmentally friendly equipment available?	Green product	0,50	0,60	0,30
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	1,00	0,60	0,60
			"Extended" warranty	0,00	0,50	0,00
Total **Partial**					10	3,40
TOTAL						**3,40**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Asus

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	
	Discard	0	0	0,00	0,00	
2	“Energy Star” Label	3	3	100,00	1,00	
	Stand-by mode	1	0	0,00	0,00	1 - product
3	ISO 14001	1	0	0,00	0,00	1 - product
4	RoHS	5	5	100,00	1,00	
5	CO_2 reduction	5	5	100,00	1,00	
6	Green products	2	1	50,00	0,50	1 - product
7	Green suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	0	0	0,00	0,00	
	Recycling	0	0	0,00	0,00	
10	Warranty	5	5	100,00	1,00	
	"Extended" warranty	1	0	0,00	0,00	1 - service life

APPENDIX N – MANUFACTURER: SAMSUNG

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Samsung		**Research: November 2017**				
Electronic site: http://www.samsung.com/br/pc/all-pc/						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner ?.	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	0,70
		Products with the selection of reduced energy consumption?	Stand-by mode	0,60	0,70	0,42
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	1,00	1,00	1,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	Green product	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,60	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,00	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	1,00	0,60	0,60
			"Extended" warranty	0,00	0,50	0,00
Total **Partial**					10	2,72
TOTAL						**2,72**

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Samsung

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	
	Discard	7	1	14,28	0,14	3 - products, 3 - support
2	“Energy Star” Label	3	3	100,00	1,00	3 - products
	Stand-by mode	5	3	60,00	0,60	4 - products, 1 - question
3	ISO 14001	0	0	0,00	0,00	
4	RoHS	2	2	100,00	1,00	
5	CO_2 reduction	3	0	0,00	0,00	3 - support question
6	Green products	0	0	0,00	0,00	
7	Green suppliers	0	0	0,00	0,00	
8	Green Packaging	0	0	0,00	0,00	
9	Disassembly	0	0	0,00	0,00	
	Recycling	2	0	0,00	0,00	1 - support, 1 - English
10	Warranty	1	1	100,00	1,00	
	"Extended" warranty	1	0	0,00	0,00	1 - HP transference

APPENDIX O – MANUFACTURER: POSITIVO

RESEARCH PROTOCOL - ELECTRONIC SITES OF THE MAIN COMPUTER MANUFACTURERS, IN RELATION TO THE AVAILABILITY WITHIN LR AND TIV PERSPECTIVES.						
Response patterns in relation to the investigated criteria are characterized by Partial Assessment (information available) and NO (information not available). Most relevant criteria have higher weights, based on laws, rules and guidelines.						
Manufacturer: Positivo			**Research: March 2018**			
Electronic site: http://www.techtudo.com.br/tudo-sobre/amazon.html						
Available information			**Evaluation**			
No.	**Criteria**	**Question**	**Keyword**	**Partial**	**Weight**	**Grade**
1	Reverse logistic	Are there LR procedures: dispose of the equipment in an environmentally correct manner?	Reverse logistic	0,00	1,00	0,00
			Discard	0,00	1,00	0,00
2	Energy Efficiency	Concern about making energy-efficient computers?	“Energy Star” Label	1,00	0,70	,000
		Products with the selection of reduced energy consumption?	Stand-by mode	0,70	0,70	,000
3	ISO 14001	Does it have an Environmental Management System (SGA)?	ISO "14001"	0,00	0,70	0,00
4	RoHS	Concern in the process of manufacturing computer products with the reduction or absence of dangerous substances?	RoHS	0,00	1,00	0,00
5	CO_2 reduction	Practices and strategies: aimed at minimizing the emission of polluting gases?	CO_2	0,00	0,80	0,00
6	Green products	Environmentally friendly equipment available?	Green product	0,00	0,60	0,00
7	Green suppliers	Concerns about negotiations with green suppliers?	Green supplier	0,00	0,600	0,00
8	Green Packaging	Concerns in the manufacturing process: green packaging?	Green Packaging	0,00	0,60	0,00
9	Easily recyclable product	Does the product go through manufacture, aiming at ease of disassembly and recycling?	Disassembly	0,80	0,60	0,00
			Recycling	0,00	0,60	0,00
10	Warranty	Does the product offer warranty service?	Warranty	0,40	0,60	0,00
			"Extended" warranty	1,00	0,50	0,00
Total Partial						0,00
TOTAL						0,00

Classification	Level	Punctuation	Result
Excellent	High Commitment	10 - 9,0	
Great	Commitment	8,9 - 7,0	
Good	Commitment requires improvement	6,9 - 5,0	
Regular	Low commitment	4,9 - 0	Positivo

GROSS DATA

No.	Keyword	Search result	Relevant information	%	Partial	Grade
1	Reverse logistic	0	0	0,00	0,00	0,00
	Discard	0	0	0,00	0,00	0,00
2	“Energy Star” Label	0	0	0,00	0,00	0,00
	Stand-by mode	0	0	0,00	0,00	0,00
3	ISO 14001	0	0	0,00	0,00	0,00
4	RoHS	0	0	0,00	0,00	0,00
5	CO_2 reduction	0	0	0,00	0,00	0,00
6	Green products	0	0	0,00	0,00	0,00
7	Green suppliers	0	0	0,00	0,00	0,00
8	Green Packaging	0	00	0,00	0,00	0,00
9	Disassembly	0	0	0,00	0,00	0,00
	Recycling	0	0	0,00	0,00	0,00
10	Warranty	0	0	0,00	0,00	0,00
	"Extended" warranty	0	0	0,00	0,00	0,00

Note: in the search, all the answers obtained were: "No results found."

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